PR

Grassland Machinery

Farm Vehicles

WORLD CROPS

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Photo: Borax Francais S.A.

Boron deficiency symptoms in grapes, showing the characteristic foliar discolouration and 'hen and chickens' formation of the fruit *For further details see page* 288

The scourge of Allah knows no mercy!

Locusts! Locusts!

The cry of horror spreads like wildfire through the plantations. In swarms numbering thousands of millions, the locusts mercilessly devastate the citrus crops. Within a matter of a few hours, all hopes of a bumper harvest have been crushed. The plantations lie waste: not a single leaf escapes attack by these ever-ravenous pests.

Wherever the dark clouds of enormous locust swarms appear, immeasurable harm is inflicted bringing hunger and distress to the planters.

Planters and farmers can fully rely upon the chemical industry to help them to reap good harvests. Highly qualified technicians, biologists and chemists of Farbenfabriken Bayer work untiringly in their efforts to find new and more effective pesticides for protecting vital agricultural crops – a task of supreme importance.

The crops of the earth must supply abundant food for us all. And for this very reason modern crop protection today has a high responsibility to mankind.

Farbenfabriken Bayer provide agriculturists in all parts of the world with products which ensure full success in the battle that is waged not only against locusts but versus a huge host of pests.

Cupravit, copper spray
Pomarsol, TMTD spray
Folidol, E 605, methyl parathion, ethyl parathion
Metasystox, Systox, systemic insecticides
Dipterex, Gusathion, Chlorthion, new type insecticides
Hedonal, herbicide
Tugon, fly killer
Seed Dressing of all types for all uses
(mercury, hexachlorobenzene, TMTD, COBH)

BAYER

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Editorial Comment

Farm Mechanisation and the Horse

SINCE THE Second World War, farm mechanisation has proceeded at a very rapid rate in Western Europe, North America and Oceania. At the end of 1949 there was in use in Western Europe one tractor for every 400 acres of arable land; by 1957, there was one tractor per 150 acres. During the same period, 1949 to 1957, in North America the ratio increased from one to 135 acres to one to 110 acres, whilst in Oceania it had risen from one tractor per 320 to one per 200 acres.

The increases in the numbers of combine harvesters, milking machines, trucks, internal combustion engines and electric motors on farms in the areas mentioned have been equally striking over this short period of time.

In assessing the effect of these changes on farm economics, it is common to consider only the reduction in manpower employed, which is indeed amazing. To illustrate this, it may be mentioned that 100 years ago in England it took eight men to scythe an acre of wheat in a day; now eight men on combine harvesters, with attendant trailers, can cut and thresh 160 acres a day.

The saving due to machines, however, does not end there. As more machines are employed, so less horses are needed, and more land is thereby released for food production—land otherwise used to produce feed for draught animals. It needs about 2½ acres of land to maintain a horse.

Over the period 1949 to 1957 the total horse population in Western Europe, North America and Oceania has decreased steadily, by about one-third, from 26 million to about 18½ million. This reduction of 7½ million animals has released the equivalent of no less than 19 million acres of fertile land for human food production.

Independence or Interdependence

AGRICULTURE, IN contrast to manufacturing industry, has a large number of producing units, each marketing on its own behalf, with little influence beyond the farm gate. There is in addition a dearth of information about the market situation and generally a lack of confidence between the various sections of the industry.

A small unit is naturally not able to provide the finance necessary to buy the requisite marketing skills and to pay the costs of advertising. According to Mr. David Pickard of Produce Studies Ltd., a commercial company, based on voluntary co-operation rather than on statutory and therefore compulsory, industry-wide organisations, provides the best solution for increasing the size of marketing units. It would, he said, be better able to meet foreign competition and to cater for the large purchasing units that are springing up in the retail trade. To achieve this, the small farmer would obviously have to surrender a certain amount of his independence, and to recognise that interdependence is just as necessary.

Quality Tells

THE ONLY true and final judge of the value of a product, he continued, is the consumer, so one essential condition for improvements in agricultural marketing is the establishment of quality standards, directly related to those applied by the consumer, and operating through the mechanism of national brands. Promotion of the brands through advertising them would help to correct fluctuations in the retail demand for a product. There must, however, be certainty about quality before advertising can begin and top quality produce should be the spearhead of any advertising campaign.

Examples of the advantages to be gained through the organised marketing of branded products which we can call to mind are the 'Sunkist' oranges of California and 'Outspan' oranges from the Union of South Afria; 'Cebu' sun-dried copra from the republic of the Philippines and 'Kenaroma' coffee from Kenya.

World Food and Population

WE DRAW particular attention to the article on page 297 by V. S. Swaninathan, wherein the author hints at the hopelessness of increasing agricultural production in India to meet the ever-increasing needs of her ever-growing population.

For some time now there has been an unparalleled upsurge in population, especially in the less developed countries. Death rates have fallen sharply with, so far, no corresponding fall in birth rate.

The question—we cannot help asking ourselves and the answer is not obvious—is 'Can food production be increased sufficiently rapidly to meet the ever-growing demand for more food and better food?'

So far improved methods of agriculture have been effectively applied only in the more advanced countries, with the result that there are serious food surpluses in some areas and serious deficiencies in others.

Eight Questions

THE PRESENT situation raises a bewildering series of major questions: 'How can the farmers of the less developed countries be taught the newer methods of agriculture?' 'How well are these methods suited to their conditions?' 'What are the important gaps in

our knowledge and what new research is still needed?' 'What changes should be made in the traditional patterns of land tenure, of farm credit, and of marketing to create favourable conditions for agricultural development?' 'Is the rapid development of food production likely to be in conflict with age-old beliefs, customs and cultures?' 'How can the standard of living be raised and what steps can be taken to bring about a sufficiently rapid change in the standard of education?' 'How can all this be financed?' 'Can this and still more be done in time to avoid the tragic consequences of population growth in certain areas seriously outrunning food supplies?'

Because of the magnitude and urgency of these eight questions the British Association has rightly decided to devote a considerable amount of time to their discussion at the annual meeting at Cardiff on 5 September. In our feature 'Coming Events' is listed the panel of seven distinguished scientists—each of them authorities in the important field of demography—who will participate in what may well prove an historic event, a symposium on 'World Food and Population'. We would urge all our readers who are able to do so to be present.

Incentives

We have done with Hope and Honour,
We are lost to Love and Truth,
We are dropping down the ladder
Rung by Rung
And the measure of our torment
Is the measure of our youth.
God help us, for we knew the worst too young!

Kipling (1865-1936).

MONEY HAS become the primary incentive to effort in our Western civilisation. It is true that money is important in providing a means of exchange of services for goods, goods for services and goods for goods, but the amassing of wealth is being degraded by the opportunities offered by inflation, by the possibilities of easy money through gambling and the enormous salaries resulting from processes and inventions which multiply human effort. Great wealth is in no sense a measure of a man's importance to the world. Such riches may give him temporary pleasures, and soft and easy living, but they can also take away his ideals and may deny him the joys of the simple life, so well expressed by Lin Yutang* and George Borrow.

With the passing of empires, the decline in religious belief and the growing feeling of uncertainty about the future of the world, immediate material considerations have become paramount, and dedicated service, such as that given by Livingstone, is almost a thing of the past. Men who cannot make money are not very highly regarded, even though their contributions through their devotion to a cause or an idea may be enormous; they succeed because they give that little bit extra, because they believe what they are doing is for the benefit of mankind.

So far as individual countries are concerned, there is provision for the award of honorary degrees, awards and medals by learned societies for outstanding contributions to science, but for those who go to remote places and live in primitive conditions in the more backward areas of the world there is now no longer any system of rewarding or appreciating exceptional work other than by money—yet some services are beyond price; some men do much more than they are paid to do; some men are so dedicated to a cause that their success is almost inevitable. For such men the greatest incentive is the approval of their fellows and what better than by a system of honours and a citation of their achievements.

The Fellowship of FAO

THE SUPREME authority in the field of international agriculture is the Food and Agriculture Organisation of the United Nations, and this would be the appropriate authority to make awards for solid achievement towards the advancement of agriculture in all parts of the world, not excluding the U.S.S.R., China and other countries at present outside the membership of FAO. The award—the Blue Riband of Agriculture or 'FAO' award—could be made in much the same way as the Nobel Peace Prizes are awarded, for are not these achievements also solid contributions to world peace?

One of the difficulties in implementing schemes for the advancement of agriculture in backward areas lies in this problem of salaries, for what would be regarded as a low salary by a man from a country with a high standard of living would be a princely salary for a crop specialist from a country with a lower standard of living. Thus it is sometimes difficult to secure the best or most experienced men who alone are good enough to serve the cause of advancing world agriculture; some incentive which is beyond price and above suspicion is, we consider, essential.

All systems of honours and awards are, however, liable to abuse and political influences will not be slow in bringing pressure to bear. This needs to be guarded against by the appointment by the Director-General of FAO of a panel of top-ranking agriculturists having no political affiliations to make the awards. The award should be made for devoted and dedicated service to agriculture, more particularly in the backward and less advanced countries, and should generally be awarded for concrete achievement. It should not be awarded for chairmanship, for service on committees, for planning, for reporting on conditions, or for overall administration; such services are usually well rewarded financially and the officers are adequately honoured and respected during their term of office.

* *The Importance of Living*. By Lin Yutang. From Technical Books, 308 Euston Road, London, N.W.1. 23*s*. 6*d*., post free overseas.

We suggest, too, that the awards should not be restricted only to the overseas staff of FAO, but should also be given to all who serve agriculture, anywhere in the world in any capacity, who have done outstanding work and obtained results, so contributing materially to the health, wealth and happiness of mankind.

Advances in Pea Growing

THERE HAS been a tremendous advance in the growing of peas in Britain and the area under this crop is now five times what it was in pre-war days. This expanded acreage has led not only to the crop being grown more intensively in East Anglia, but it has spread to other counties as well. This, in turn, has led to a growing demand for advice, not only from newcomers to the industry, but also from experienced growers.

Research on peas is at present being carried out by five bodies: the National Institute of Agricultural Botany gives particular attention to trial and inspection of pure seed samples. The National Vegetable Research Station at Wellesbourne in Warwickshire is doing fundamental research on various aspects, such as the correct time for irrigation and the amounts of water to use at various stages in the growth of the plant. It also studies the problems arising from the selective control of weeds in the crop and in particular the best time to apply the approved weedkillers so as to keep the phytotoxic effects to a minimum. The third organisation concerned with this crop, known as the Pea Growing Research Organisation Ltd., is working in close co-operation with other research bodies, including the Fruit and Vegetable Canning Research Station at Chipping Campden, Gloucester. Finally, there is the National Institute of Agricultural Engineering Research at Silsoe, which tests and evolves new machines for cultivating and harvesting peas.

On Members' Day

AT A recent field day of the P.G.R.O. we inspected the field trials and experiments which are being carried out at the Research Station at Yaxley, near Peterborough, and at a number of sub-stations. No less than 45 varieties of peas were under trial to determine which of these varieties mature earlier and mature late so that the processing season for canning and deep-freezing can be extended. Subsequently the most promising of these varieties are sent for further trials and confirmation at the sub-stations of the N.I.A.B.

Another useful series of trials inspected was for the evaluation of various new herbicides applied before sowing, before the emergence of the crop and after the crop had emerged. Particular attention was being given, not only to the effectiveness of the control, but also to the effect on yields. This experiment was repeated for the five most promising herbicides used in association with 10 varieties of peas to determine what are their reactions and inter-reactions.

Pesticides and Public Policy

A CONTINUOUS SUPPLY of wholesome, nutritious food at present-day low prices is possible only with the proper use of pesticide chemicals. Recent unfounded and sensational publicity adverse to the use of pesticides threatens both our adequate food production and many public health programmes.

Many segments of the problem have been the subject of public discussion and consideration. The broad aspects and implication of the current discussions which affect every individual in the United States, the U.K. and many other countries have not, in many cases, been fully recognised. Some of these are outlined in a pamphlet entitled 'Pesticides and Public Policy', prepared and distributed by the National Agricultural Chemicals Association, of Washington, D.C., U.S.A.

The pamphlet points out that the present abundance of wholesome foods is more likely to be credited by popular writers and the public to modern farm machinery than to chemicals. The machinery which speeds planting, cultivating and harvesting is visible. The chemicals which protect crops from insect, weed and disease damage and from rodent contamination are not.

Producing meat, milk, grains, fruits and vegetables to feed 180 million Americans three times a day every day of the year is a big job and a serious responsibility. If this flow of foods were cut off completely for two weeks, most of them would starve to death. While this possibility seems far-fetched today, this actually did

'Why can't they find some way of controlling that *pest?'*

take place in Ireland; about 100 years ago Ireland's main food source—potatoes—was all but wiped out by a fungus disease called late blight. Millions died or fled the country in a national tragedy that chemicals —now in regular use—could have prevented.

An even more difficult food supply problem faces man today than faced him 100 years ago. *The number of people to be fed is increasing by* 100,000 *people every day*. World population is expected to rise from 2.8 billion now to over 6 million in the year 2000.

Can we do it? Agricultural scientists say we can. That is, we can if we continue scientific research and if we continue to use the results of research to the maximum in our food production. This means using the latest developments in improved seeds, improved plants, the best machinery, fertiliser and the most effective means of protecting crops against destructive pests. Above all, it means a maximum use of chemicals in agriculture.

The invisibility of chemicals, nonetheless, leads the general public and, at times, legislators as well to overlook the really critical role chemicals play in our economy, our agriculture, and in protecting our public health. There is indeed a regrettable public tendency to concentrate attention on real or fancied ills allegedly caused by the misuse of a few of these chemicals.

European Trade Patterns

COUNTRIES IN the European Common Market—'The Six'—and in the European Free Trade Area Association—'The Seven'—traditionally buy far more agricultural products from the outside world than they do from each other. This and other basic relationships in agricultural trade among European countries and the rest of the world emerge from the study of a document on 'Major Developments in the World Agricultural Commodity Situation', now being discussed by FAO's Committee on Commodity Problems. It is based, however, on statistics for 1957, the latest year for which detailed information is readily available, and thus relates to a period preceding by more than a year the birth of the European Common Market.

Thoughts on Advertising

IT IS most unusual for an editor to express his views on advertising. The only excuse we can offer is that we once took a course in advertising in a prisoner-of-war camp; this took the form of class criticisms of advertisements torn from newspapers and other periodicals. It was really most instructive and amusing to learn how much money is wasted on bad advertising.

Surveys show that in a well-established journal, reader interest in the advertisements is as great as their interest in the editorial, but some advertising is indeed sheer waste; it is so dull, so unattractive, so crowded as to be almost unreadable and the reader flips from one page to the next, leaving the advertisement unread, and the poor advertiser might blame WORLD CROPS for the lack of response.

Some people will say they are allergic to advertising. Otherwise expressed, there are so many calls on their attention that they shut their eyes, their ears and their minds to new ideas. People like that do not really matter, as they are out of the race already.

If advertising fails to attract attention, however, it may be because the style is wrong or the wording is wrong. The advertiser may need to try a change in style—or a change in his method of appeal to the public —for a small change in expression can make all the difference.

Then there is the so-called prestige advertising. While others deal with this or that aspect of their products, some have once learned that repetition is the surest way of making an impact. This may be satisfactory for sophisticated readers who are content with things as they are.

Readers of WORLD CROPS are agriculturists and agriculture is today in a state of world revolution. Our readers need more than a repetition of a name or a trade mark with various embellishments. Essentially, readers buy WORLD CROPS because *they want to keep up to date;* they want to learn *new* things and obtain *new* ideas. Is prestige advertising, therefore, the right kind of advertising to go to the four corners of the earth through the medium of WORLD CROPS?

This Month's Cover Picture

Both the vine and the fruit of grapes are affected by boron deficiency. In severe cases only a few shrivelled fruit may develop, resulting in considerable financial loss to the grower.

Easily recognisable symptoms of boron deficiency are the dieback of shoots, shortening of the internodes, and yellowing and early fall of the leaves; secondary buds may also develop to replace dead shoots. Reduction of fruit set and the appearance of small seedless berries due to boron deficiency produce the typical 'hen and chickens' symptom.

The application of a boronated fertiliser in the early spring or foliar spraying with 'Solubor'* after flowering will prevent boron deficiency and result in improved quality and yield.

BORAX CONSOLIDATED LIMITED
Borax House, Carlisle Place
London, S.W.1

* Registered Trade Mark

Photos: Institution of Agricultural Engineers

Left: *Cotton—a common load transported by carrier.* Right: *Heavier loads can be carried by the use of a trailer, making more effective use of the bicycle as a means of transport*

Farm Vehicles

*Transportation in Tropical and Sub-tropical Agriculture**

J. E. MAYNE, B.SC., M.I.A.E.†

Agriculture and animal husbandry in tropical and sub-tropical countries so often involve the employment of much labour in transporting crops from field to village. Animals and men tend to be overburdened with this relatively unproductive work and can be much better employed.

Photo: Nuffield Exports Ltd.

South Africa: Sugar-cane being transported by trailer from the field to the railway siding

PRIMITIVE methods for transporting agricultural produce are still used. Human beings can carry head loads of as much as 90 lb. over short distances and loads of 30-40 lb. are commonplace. Many thousands of tons of produce are carried from isolated areas by head loading, sometimes for distances of 15 miles or more.

Donkeys are excellent for carrying loads of up to 200 lb. for a few miles. Bulls are better for draught than porterage, because they can carry only about 200 lb. and are slow, whereas they can pull eight or 10 times their weight on wheels over long distances.

The Hamla camel is, perhaps, the world's greatest beast of burden. It can cover huge distances where time is of little importance and rainfall is less than 20 in. a year. Each can carry a balanced load of 500 lb.

These methods cost comparatively little in cash, but much in time. For none of these methods is it necessary to have a road and little improvement on them may be expected until roads are provided.

The bicycle

Despite official schemes to increase the popularity of carts, the bicycle remains the primary means of transport in tropical countries. In Malaya bicycles are often used to transport rubber latex to collecting points, where it is transferred to trailers or lorries. In Uganda transport of bales of cotton is frequently undertaken on the standard type of bicycle fitted with a strong rear carrier. An average load is about 70 lb.

It is now very common to see very large loads being transported on bicycles, some fitted with trailers. Urban areas in Africa are now almost entirely supplied with milk and vegetables transported on bicycles.

There has been no serious attempt to amend the design of the bicycle. The front forks may be strengthened, and a rear stand is often fitted, but, at least in Africa, there is strong resistance against the use of bicycles fitted with a large front steel carrier.

* An abridged version of a paper presented at a meeting of the Institution of British Agricultural Engineers, 14 January, 1958.

† Colonial Development Corporation.

Farm carts

The farm cart is a vehicle which has been lacking throughout the vast middle block of Africa and the use of which is now being sponsored by several governments. In Nyasaland, for instance, a subsidy scheme was introduced by the Government in 1951 designed to encourage the purchase and use of carts by African farmers.

The purpose of the scheme has been achieved on an impressive scale and has also resulted in a growing appreciation of the value of oxen as draught animals, which should increase the demand for ox-drawn implements, such as ploughs and ridgers.

The carts are of Southern Rhodesian origin, but certain parts are manufactured in Europe. Prices vary from £30-55, depending mainly on whether the cart has steel wheels or pneumatic tyres. Despite the higher price, the Nyasalander usually favours the pneumatic tyres.

A heavy wooden Scotch cart, with large wooden wheels, 3- or 4-in. iron tyre shrunk on, and an imported steel axle, is made in the village craftsmen's shop and costs about £45. Four to six oxen are required to pull it.

A light wooden cart, with steel-spoked wheels 30-in. dia. and 3- or 4-in. rim, bushed bearings, is mass-produced in Southern Rhodesia and assembled locally. It costs about £40. It requires two light oxen. A similar cart, drawn by two light oxen, is pneumatic-tyred, has steel wheels and roller bearings, is imported from Southern Nigeria and costs about £60.

A sheet-steel cart, with small box body, cranked axle with stays, disk wheels with solid rubber tyres, is imported from Britain and costs about £30. It requires two light oxen, or more in muddy conditions. Although solid rubber tyres have much to recommend them, the wheels are small and rather narrow for soft conditions.

Need for roads

A good laterite road suitable for all forms of traffic in a bush area costs about £1,000 per mile. Some governments (*e.g.* Ghana) are developing a system of feeder roads to link small areas of cultivation with public roads. Such feeders are usually merely cambered earth trails, from which shrubs and rocks have been removed, meandering between the larger trees and occasionally plunging into gulleys which are too wide to cross on log bridges. The useful life of such a road may be only one dry season.

Photo: The Rover Co. Ltd.

Pictured at a river crossing are two Land-Rovers. These 4-wheel-drive models have an 88-in. wheelbase, a petrol or diesel engine and p.t.-o. points

Photo: Bonser Engineering Ltd.

The 10-cwt. Bonser truck for negotiating narrow gateways and glasshouses in commercial market gardens

Trails of this nature can usually be made with a standard or heavy-wheeled tractor, a dozer blade and a blade grader. Some such roads have been taken over by public works departments for development as highways.

Lorries

As soon as roads have been established the first type of vehicle to appear is usually the trader's motor lorry. By moving supplies into farming areas and produce out to consuming areas, these hauliers play a very important part in agricultural development.

In tsetse fly regions, where cattle cannot be kept, the motor truck may be the only alternative to head loading. In some places lorry owners charge low rates to compete with porterage or animal haulage. In Northern Nigeria, evacuation of cotton and groundnuts is done by motor trucks,

Photo: Vauxhall Motors Ltd.

England: wheat being threshed; the straw is stacked and the grain is sent in bags by Bedford truck to the granary

usually costing about £1,000, and the owners expect to recover the cost of their vehicles in three months.

Ropeways

Another means of access to isolated sites on tropical plantations is the aerial ropeway. Light ropeways may also have advantages in some peasant farming localities, their main advantages becoming evident in rough terrain. Aerial ropeways are used on some tea and sisal estates.

Large-capacity ropeways capable of carrying up to 300 tons per hour are expensive to install, but lighter equipment is now being introduced. A Swiss company, for instance, offers an endless mono-cable which can be temporarily mounted, where possible, on the trunks of growing trees. A skid-mounted diesel power unit provides the traction and about 20 tons per hour can be moved over a distance of 2½ miles. Experiments have been conducted in Germany with a light alloy portable ropeway supported on alloy shearlegs.

Land trains

In 1932 a British engineering firm placed some land trains in China for operation over roadless country. This theme was further developed into monster translandic trains of some 200 tons capacity. Now, 20 years later, an American company has revived the idea and has built two prototypes. These vehicles can transport extremely heavy loads over terrain impassable to, or extremely difficult for, other types of heavy cargo carriers. Cross-country operation is said to be efficient and economical and costs per ton-mile are claimed to be less than for normal transport over improved roads.

The equipment consists mainly of two types of diesel-electric cargo-carrying machines. One type is a single unit, six-wheel drive, 35-ton transporter with a range of special tyre sizes. The recorded pull of such a vehicle loaded with 32 tons is 57,000 lb. at a maximum speed of 15 m.p.h.

The second type is the cross-country freighter multiple car, with all wheels driven, and made up of standard components according to users' requirements with regard to horse-power, capacity, tyre size, load, ground pressure and climatic conditions. A freighter may be a 100- or 185-ton train.

The former consists of three six-wheel cars linked together, the power car carrying the diesel-electric generator, the control cabin and a payload of 26 tons, the following cars each carrying 37 tons. The 185-ton train is made up of six six-wheel drive cars, the power car being entirely devoted to the generation of power and control of the train. These freighters are used in the Arctic to supply remote posts. They have also been reported to be at work in the South African goldfields and in deserts and jungles.

Tractor trailer trains have been successful in a few regions. One such venture operated in a Malayan rice-growing area has proved profitable. The trailers are small and can be manhandled quite easily. They are suitable for narrow roads and a number of widely dispersed trailers can be readily assembled into one train for haulage to a rice-milling centre. Similar trains have been used in coconut estates in Malaya and are now being introduced on some Rhodesian tobacco farms. The employment of tractor trailers on sugar-cane and sisal estates appears to be replacing the old-established systems of estate transportation and leading to a reduction in labour requirements.

The Hutchinson Sugar Co. in Hawaii provides an extreme case of specialisation in agricultural haulage. This estate of 5,200 acres of cane is situated on an exceptionally fertile mountain side. The haul starts at an elevation of several thousand feet and drops down to the factory. The haul route drops 2,500 ft. in three miles.

The company uses dual-axle semi-trailers, pulled by dual-drive, off-highway trucks. The power unit is a 250-h.p. supercharged diesel which maintains a practically constant performance from sea level to 12,000 ft. The trucks are fitted with torque converters, torqmatic transmissions and torqmatic brakes. These facilities reduce driver fatigue and simplify training; there is less damage to gears and brake life is extended to six times that of other methods of beaking. The trailers are designed to carry 25 tons. Tyres of size 16 x 21 aid flotation in

muddy fields and do not pick up stones like double wheels.

Miscellaneous special vehicles

Recent introductions include a dual-purpose trailer which, in addition to the usual deck space, has a hollow chassis which will carry 100 gal. of liquid. In Malaya rice-milling trailers are in use equipped with huller, polisher and cleaner, driven by p.t.-o. from the tractor which pulls the unit from village to village. In North America mixed stockfeeds are prepared in special vehicles. A typical unit consists of a hammermill, a dust collector and a molasses mixer, all mounted on a motor truck chassis or trailer. The mixing operation can therefore be performed on the site where the feed is to be consumed.

High wire-sided trailers are used for transport of coconuts on some plantations. On a West Indian plantation some success has been achieved with an articulated vehicle consisting of two trailers connected with a single universal coupling at a point directly above the single coupling.

Some coconut estates in Malaya and British Guiana are laid out in such a way that the whole field drainage system, consisting of open trench drains, can be flushed with water from a higher level. To transport coconuts from field to factory the nuts are kicked into the nearest drain and the system flushed. At the mill, situated near the drainage outfall, the floating nuts are collected by a steel grille.

Photo: R. G. LeTourneau Inc.

An overland train that rides on 54 10-ft. high x 4-ft. wide rubber tyres is now in production by R. G. LeTourneau Inc., of U.S.A. This multi-unit carrier, consisting of 13 cars, is 560 ft. long and, with two power cars, has a total payload capacity of 150 tons

The pictures are included only to illustrate the text; the machines are not officially recommended by the Institution of Agricultural Engineers or the author.

Organic Irrigation in Switzerland

Forty British farmers flew back to London last week after spending three days studying Swiss methods of organic irrigation. They had taken part in a tour organised jointly by *Farrow & Sons*, of Spalding, and *Bucher-Guyer Ltd.*, farm machinery manufacturers, of Zurich.

In visits to seven farms the party came quickly to realise that careful conservation of dung and urine, for regular field distribution was a fundamental farm practice in this area of Switzerland.

Distribution was at one time effected by special liquid manure carts, but since the 1920s more and more farms had been equipped with pumps and pipelines through which liquid material could be conveyed to, and eventually spread on, pastures. Today one-fifth of all farms in Switzerland have some kind of pumping equipment for liquid manure and nearly one in 10 have a piston pump and organic irrigation pipelines. Many of the pipelines are permanent underground installations.

On Herr Johann Guyer's 100-acre farm at Bubikon—a dual-purpose installation comprising 1,600 yd. of underground main, a three-stage pump, cess pit and agitator ensured that all the 90 acres under grass could be irrigated either with urine and dung water from the cowshed or, in summer, with pure water. Herr Guyer fed his 50-strong pedigree herd from his holding and since the irrigation system was installed has doubled his output of hay, so that he can now sell half his output.

Exponents of zero grazing in the party were fascinated to see that this system was universally employed. Glossy-coated Simmental and Brown Swiss cows were kept in their stalls all the year round and grass was cut and carted to them each day. They might, however, be allowed occasional exercise in spring and autumn.

While being much impressed by the high level of efficiency in some features of the farming they saw, the visitors appreciated that different conditions gave use to different needs. Organic irrigation was certainly popular and economic where it was used and was one of the techniques which could be usefully employed on those British farms where the circumstances were right.

The party also saw a pioneer scheme for orchard frost protection by sprinkler irrigation. This system will be described in a future issue.

Machinery for Grass Conservation

W. H. CASHMORE, C.B.E.*

Modern advances in farming methods and equipment have paved the way to more efficient grass conservation. The capital outlay in making improvements and changes is considerable; it is essential, therefore, to select the right machines and use them correctly so as to obtain the best results under the prevailing conditions.

David Brown Albion 'Super Hurricane', a prototype one-man green-feeding and silage-making outfit, which is capable of cutting, loading and blowing the cut crop direct into the silo or discharging it via the cross-conveyor attachment fitted to the near side

THERE are so many variables in farming conditions, methods and machines, that it is not easy to make a choice on the basis of the printed information available. It often happens that in a particular class of machine there is little to choose between the various makes, but much depends on the way in which they are used.

The purpose of this brief review is to indicate some of the major points to look for in determining the type of equipment suitable for a particular set of conditions, and to mention important facts which have emerged from experimental work, but which may not be obvious to the observer. The machines to be covered are fertiliser distributors, forage harvesters and baled hay driers.

Massey-Ferguson '721' spinner broadcaster, which has a hopper capacity of 7 cu. ft.

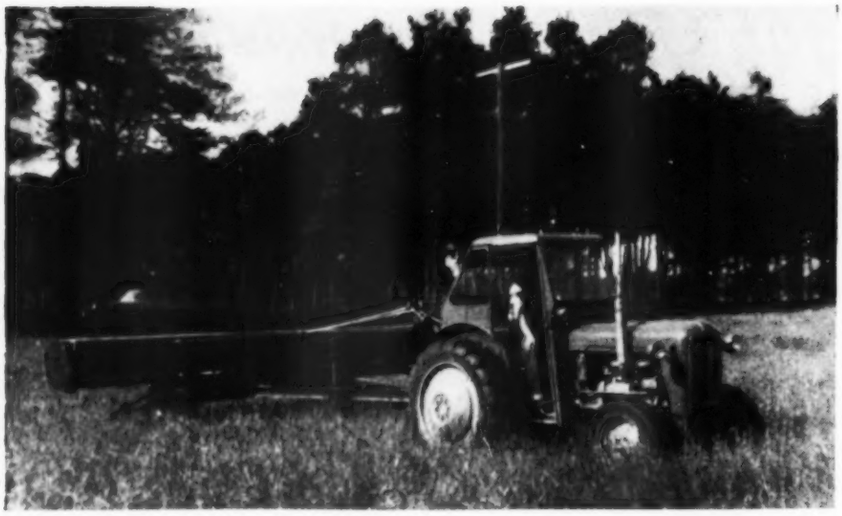
FERTILISER DISTRIBUTORS

These fall into two broad groups: constant - width and spinning - disk machines.

The constant-width type mainly use the plate-and-flicker principle. The system consists of horizontal dished plates which rotate slowly at the bottom of the hopper and carry the fertiliser through adjustable feed gates to be distributed by rotating flickers.

The spinning-disk distributor consists of a hopper with a gravity feed and variable outlet, mounted above a disk or disks which rotate horizontally at high speeds. Radial-mounted cleats on the disk throw the material sideways and backwards for a considerable distance. Swinging-outlet machines are somewhat similar except that the lateral spread is obtained by throwing the fertiliser from a horizontally swinging outlet.

* Director, National Institute of Agricultural Engineering.



'Wilmo' distributor, by Alexander Shanks & Son Ltd., seen working on grassland

overlapped by the same pattern of spread as that on the previous run. Once the overlap has been established it is necessary to keep the centre lines of successive runs at a constant width and it is best to use markers to assist the tractor driver.

It should be pointed out that a cross-wind and any undue deviation from the recommended disk spread will upset the pattern. To avoid the latter it is essential to use a tractor with a fitted speedometer and revolution counter.

There is still some doubt about the necessary degree of distribution. It seems that, in many cases, variations up to $\pm 20\%$ will not affect the economics of fertiliser distribution.

The choice

The choice of a distributor depends a good deal on the requirements. Constant-width machines are more versatile and will deal satisfactorily with most types of material over a wide range of application rates. Their spreading width is constant with a reasonably even transverse distribution and a satisfactory longitudinal distribution, except on bumpy or uneven land. The field technique is simple and the accuracy of the work is not upset by variations in speeds of travel over the normal working range.

Spinning-disk machines have certain advantages, the more important ones being low initial cost, easy cleaning and maintenance, high rate of work, especially with low application, even longitudinal distribution on rough ground, and a good performance on sloping ground. The main disadvantage is that the setting and manipulation is more complicated and considerable skill is necessary to obtain optimum results.

New offset version of the Lundell '40' forage harvester

Value of test reports

Experimental work at the National Institute of Agricultural Engineering has shown that it is not possible to assess the uniformity of distribution visually and the information given in N.I.A.E. test reports on such machines is helpful in assessing the reliability and best method of operation. These reports give information on calibration, evenness of distribution in transverse and longitudinal directions for a full range of materials, the effects of bumps and sloping ground, and information on ease of operating, filling, setting, the turning circle and the field technique.

It has been found that spinning-disk machines give a high rate of sowing round the centre of the spread with a tapering off towards the edge. To obtain reasonable overall accuracy it is necessary to overlap the application.

Measured test results, coupled with field observation, have to be used to determine the required overlap. Experimental work has shown that the most satisfactory method is to drive the machine back along its previous run rather than work round and round. In this way each side of the spread is

On the other hand, it is possible to have a variation of $\pm 50\%$ without it being very noticeable at the time.

Assuming it is possible to obtain the required performance with a spinning-disk machine, the main advantage —the high rate of work and greater coverage per man-hour—can be offset by the complication of placing markers and filling the fertiliser into a relatively small hopper.

FORAGE HARVESTERS

Flail-type forage harvesters have gained rapidly in popularity to the almost complete exclusion of green-crop loaders and buckrakes. There are a number of sound reasons for this:

they avoid the use of the reciprocating cutter bar, a mechanism which was a constant source of trouble in the heavy work of cutting crops for silage.

They offer a big saving in labour—about half that required with the buck-rake and one-third to a quarter of the labour to operate the green-crop loader. They are able to handle short grass and so make high-protein silage a possibility and, finally, flail harvesters are reasonably low in initial cost and are simple to set and maintain.

Flails v. cutters

Evidence available indicates that the lacerated material produced by flails is as good as chopped grass and better than grass collected in the long state as regards quality of the finished product. However, laceration does not satisfy the requirements of some types of grass drier or self-feeding conveyor systems.

The flail forage harvester consists of a series of swinging cutters or flails mounted on a horizontal shaft with its axis at right angles to the direction of travel. The shaft is driven in the opposite direction to the wheels of the tractor and the crop is cut and lacerated by impact. With most machines the action of the flails both cuts and conveys the material to the trailer, which is self-loading. The only adjustment required is in the height of the flails above ground level. To avoid the risk of soil contamination, and to allow normal crop regrowth, the flails should never strike the ground.

Flail harvesters are versatile and can be used for weed and brush control. They can also pick up wilted material from the swath or windrow, though they are more efficient when cutting a standing crop. Experimental work to date shows that soil contamination is not significantly higher than with other methods and crop recovery is no slower than following the use of the reciprocating cutter-bar harvester.

In-line or off-set?

Flail harvesters may be in-line, in which case the machine is coupled directly behind the tractor, or they may be off-set to allow the tractor to run on cleared land. The in-line machines are lighter in construction and less expensive, and generally they are quite satisfactory. The advantages of off-set construction are that it is easier to watch the implement and see the trailer hitching points when changing trailers. It is possible to run a little closer to boundaries and, if soil conditions are very wet, there is less risk of soil contamination from the tractor wheels.

Power and speed

Forage harvesters have a working width of 40-60 in. They make high demands on power because they are simultaneously cutting, delivering and flailing the collected material, so it is very important to have a sufficiently powerful tractor. If the tractor is not giving its full rated power, or the crop is exceptionally heavy, or the land has gradients, power may easily be the limiting factor in effective operation.

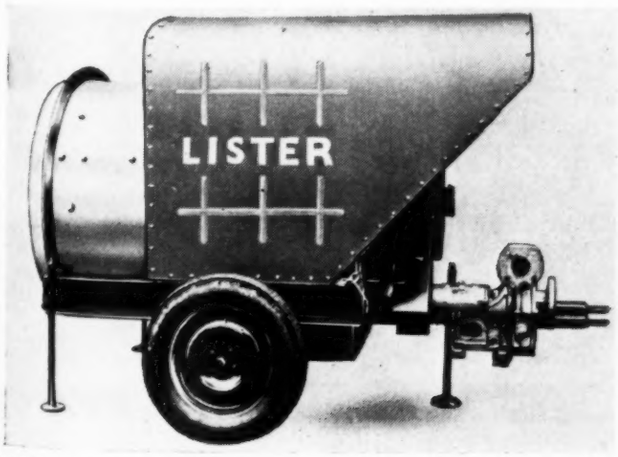
The loading rate for any given crop is dependent on width of cut and forward speed; thus it is important to use as high a forward gear as possible, provided uneven ground does not prevent this. The tractor throttle cannot be used widely in getting the best performance, because it is important to keep the flails running at the recommended speed. If this speed is exceeded, it will appreciably increase the power demand without improving the cutting efficiency.

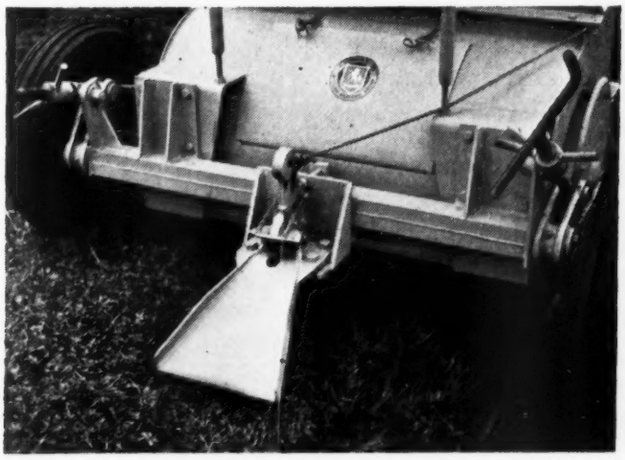
Except for work in light crops, there is not much advantage in the wider cuts with the one-man outfit. The need for a tractor having a good range of forward speeds is obvious and the skill of the operator can go a long way towards determining the efficiency and rate of work. In this he will be helped if the tractor is fitted with a speed indicator.

Silage trailers

In any method of silage making it is necessary to select a transport and unloading system and these have to be related to the type of storage and the way in which the silage will be used. If it is convenient to have a silage pit which can be filled from either side, side-tipping trailers offer great advantages, and by making the pit not more than 15 ft. wide, hand work at the pit is almost eliminated. Unfortunately, it is seldom possible to have pits and the alternative is the clamp. One popular form of clamp has a ramp at one end. Silage is tipped over the ramp until a wedge of material allows the tractor and trailer to move over the end of the ramp.

From the point of view of transport efficiency, the loads should be as large as possible, but if the tractor and trailer are to be drawn over the clamp for unloading either the loads must be kept reasonably small or a second





Left: *Lister moisture-extraction unit which is designed to deal with bales, grain and seed in sacks and also to ventilate potato stores etc.* Right: *Barford forage harvester, Mk. II, showing the automatic pick-up hitch*

tractor is needed to pull out the load if it becomes bogged down.

One-man units

For many farms, especially the smaller ones, the one-man unit offers advantages over the 'team' systems. It is possible for one man to cut, collect, transport and unload the silage on the clamp. The forage harvester is kept hitched to the tractor and obviously moving-floor trailers and special unloading devices are important.

With one-man systems the overall working rates are limited because the harvester is only working for a fraction of the time. Where higher rates of work are desirable it is better to keep the harvester working and use a tractor or tractors to transport the material to the clamp. One of the most satisfactory methods is to dump the material near the clamp (preferably on a concrete apron) and move it on to the clamp with a modified buckrake. The tractor operating the buckrake also assists consolidation.

Quick-release devices

In working any system, valuable time can be lost in hitching up and unhitching trailers and in unloading the grass. Improved and semi-automatic hitches are on the market and the better ones give a considerable saving. The trailers need high sides and a top to prevent losses in the field, but unless the tailboards, sides etc. are easily detachable, working time is lost. This applies particularly in the case of some home-made trailers. In practice it is found best to work out a system for each holding and make slight modifications according to the conditions.

BALED HAY DRIERS

The pick-up baler method of collecting hay has grown rapidly in favour because of the great economy in labour compared with other methods. Naturally, when considering artificial drying as a means of obtaining better quality hay, any method which incorporates baling in the field is worthy of consideration, for it has been shown experimentally that hay dried in the bale has a higher feeding value than normal hay and yields a greater weight per acre because of reduced losses in the swath.

Hay drying methods

Hay drying in bales falls into two distinct categories: storage drying and batch drying.

Storage drying is merely large-scale conditioning. The hay is cut at an early stage of maturity and wilted to about 35-40% moisture, a point slightly above the extreme limit for normal baling. The bales are collected and stacked on a platform and ventilated by a large volume of air at a time of day when the relative humidity is low. Supplementary heat is not essential, but sometimes waste heat is taken from the engine driving the fan, or some other form of supplementary heat is provided for the finishing-off stages, or when atmospheric conditions are unfavourable.

In *batch drying* the bales are dried on a simple device, such as a small platform or portable tunnel, and the bales are rehandled after drying. This is a method of producing relatively small quantities of high-quality hay. The hay is baled at moistures as high as 40-50% and a regular output is obtained by using supplementary heat to raise the temperature of the ventilating air by 10-30°F.

When employing an intermittent drying technique, electric heating is quite satisfactory with a loading of 30-80 kW, depending on the supply area. The advantages of electricity include flexibility, cleanliness and safety. For larger-scale work, or for continuous drying, oil-fired heating provides a suitable alternative. Modern oil-fired heat exchangers enable oil to be used without the risk of fire or taint and with little loss of flexibility.

The initial cost of an oil-fired installation is generally considerably higher than an electrical one, but the running costs, excluding maintenance, are about half that for electrical heating.

Need for experience

To be successful, hay drying in bales requires knowledge and good supervision from the initial cutting of the grass to the completion of drying. It is worth while considering ways of speeding up the wilting period in the field and the hay should be well tedded to give as even a product as possible at the time of baling.

To save labour the bales are collected and handled mechanically, and to ensure that air passes through the hay the bales should be stacked tightly together with their cut edges downwards and with the strings at the sides parallel to the direction of air flow.

In the absence of a satisfactory simple moisture estimator it is difficult to make accurate assessments of moisture content until experience has been obtained. The main errors to be avoided are collecting the hay at too wet a stage and removing it from a batch drier before the top layer is dried to the required 15%. A practical method of overcoming this is to place the top layer of the bales at the bottom of the next batch.

The pictures are included only to illustrate the text; the machines are not officially recommended by the N.I.A.E. or the author.

Bulk Handling of Apples

For many years now U.K. apple growers have harvested apples into containers with a capacity of a bushel or less, but the system has many drawbacks: manual handling of boxes, both empty and filled, is heavy in labour costs and much bruising of the fruit can occur when a box of apples is handled several times.

The introduction of pallets has to some extent reduced the manual handling, but a new technique of mechanical handling, in which the apples are harvested, carried and stored in bulk bins holding 20-25 bushels, is making rapid progress in New Zealand.

Bulk handling has now been adopted by a few apple growers in England, so that it has been possible for officers of the U.K. Ministry of Agriculture to determine what bruising occurs with this new method.

The investigation was necessarily on a small scale and it was confined only to the variety Bramley's Seedling.

The report offers the following provisional conclusions:

1. The amount of bruising in Bramley Seedling apples is likely to be less when bulk bins are used in place of bushel boxes.

2. If the bins are not too deep, bruising is not only likely to be less, but also of a less serious character than occurs with bushel boxes.

3. It appears to be best to use a bin less than 21 in. deep.

[Copies of Report M.A.F.F. 21/6/60-1 can be obtained from the Ministry of Agriculture, Fisheries and Food, London, N.W.1.]

Photos pp. 297, 298, 299: FAO

Left: *Ploughing with oxen in the traditional way at Cuttack, India.* Right: *A tractor ploughs up swampland ready for sowing. Increased mechanisation is vital if India is to support her growing population*

Feeding India's Teeming Millions

A Commentary on India's Third Plan

V. S. SWAMINATHAN, M.A., M.SC.(LOND.)

Food production for a rapidly growing population is, or should be, the corner stone of India's Third Five-Year Plan, according to the author of this critical article.

IN 1959 a group of experts from the Ford Foundation published a report entitled 'India's Food Crisis and Steps to Meet It'. It was estimated that the country's population would increase by 50 million during the five years of the Third Plan. Thus by 1965-66, 110 million tons of food grains a year will be required, but at the current rate of increase domestic production will yield only 82 million tons per annum. Imports cannot cover this deficit, which is virtually a quarter of the total requirement. For this compelling reason the American experts urged that the food problem must be treated as an operation of war, giving top priority to agriculture.

Stagnation and decline

Viewed in retrospect, the production of food grains in India stagnated, or declined slightly, from 1890 to 1945 and resulted in the annual amount available *per capita* falling from 600 lb. to 400 lb. At the end of 1958, with some 400 million mouths to feed, there was still only about 410 lb. available at the end of a good year, as against 400 lb. during the preceding three years. Looking at the problem from another angle, and ignoring the growth of population during the period, there was a bare 12% increase in agricultural output in the 45 years ending 1945, before the sub-continent gave birth to the twin dominions of India and Pakistan.

India's First Five-Year Plan registered a rise of 15% in agricultural production through an investment of some £500 million on farming and ancillary activities. In the first three years of the Second Five-Year Plan the rise in the annual rate of production was 4%.

What is planned

The Indian Ministry of Food and Agriculture recently drew up draft proposals entailing an estimated outlay of £819 million during the Third Five-Year Plan for increasing production. Mr. S. K. Patil, the Food Minister, outlined schemes to augment yields and so make the nation self-sufficient.

Production targets at the end of this period are: food grains, 100-110 million tons; sugar-cane, 9.2 million tons (in terms of indigenous jaggery);* oilseeds, 9.2 million tons; cotton, 7.8 million bales; and jute, 6.5 million bales.

These goals represent an increase of 28.6% over those of the Second Plan. It is also proposed to build up buffer stocks of 5 million tons of food grains at strategic points in different parts of the country during the next 18 months. This is calculated to meet possible shortages of $3\frac{1}{2}$ million tons of wheat and $1\frac{1}{2}$ million tons of rice. The stocks are to be maintained for up to seven years through imports, though by the end of the Third Plan period it is expected they will be sustained for the most part by domestic production.

Moreover, a package programme of intensified farming is being launched by the Indian Government in 100

* Crude sugar.

With good irrigation facilities two or three crops a year could be grown in India. New irrigation projects, such as the Emerald Dam seen under construction (left), *are needed, as well as better use of existing facilities.* Right: *The age-old system—a camel working an irrigation well*

blocks in seven selected districts. These together total an area of 5.8 million acres. This, it is computed, will double farming production in the districts concerned in five years and result in an additional yield of 2.27 million tons. The bulk of the expenditure is being met by the Ford Foundation, while India is to pay half the cost of the extra staff.

What is wrong?

What is wrong with the state of agriculture in India? There is no simple answer. In a nutshell, however, farming production has not been keeping pace with the increase in population because of the failure to exploit the resources of rural man-power to the full, to give this sector of the economy the highest priority, and to provide all concerned with a direct incentive to invest either in money or in hard toil.

India has the vagaries of the monsoon to contend with. Its soils are exhausted, partly through inefficient farming. A little more humus and nitrogen could render them very productive, so long as there is adequate water.

With good irrigation facilities two or three crops a year are feasible, an impossibility in North and Central China with its winter frosts. The small dykes around each Indian paddy plot are only 2-3 in. high, compared with 10-12 in. in China, with the result that only a small proportion of the heavy rains is retained.

The Damodar Valley Corporation's water runs freely along the channels

India's food grain production and imports

Year	*Cultivated area (millions of acres)*	*Production (millions of tons)*	*Imports (millions of tons)*
1951-52	238.62	51.2	4.8
1955-56	273.2	65.79	0.4
1956-57	275.5	68.75	2.1
1957-58	268.6	62.51	3.7
1958-59	278.6	73.50	N.A.

Estimated food requirements

Year	*Population (millions)*	*Food requirements (millions of tons)*	*Increase of production necessary*
1951	360	70	—
1961	410	85	21%
1971	460	96	37%
1981	520	108	54%

Daily calorie intake per capita

New Zealand	3,340	Italy	2,530
Denmark	3,290	Egypt	2,320
U.S.A.	3,090	Japan	2,160
U.K.	3,060	China	2,110
Sweden	3,000	Pakistan	2,020
France	2,850	India	1,890

Annual milk yield per cow in lb.

Netherlands	8,300	Fiji	1,800
Denmark	7,800	Iraq	1,700
U.K.	6,500	Pakistan	1,550
Switzerland	6,500	Egypt	1,450
New Zealand	5,800	Turkey	1,150
Canada	5,500	Malaya	800
U.S.A.	5,300	India	400

Yield per acre of staple crops

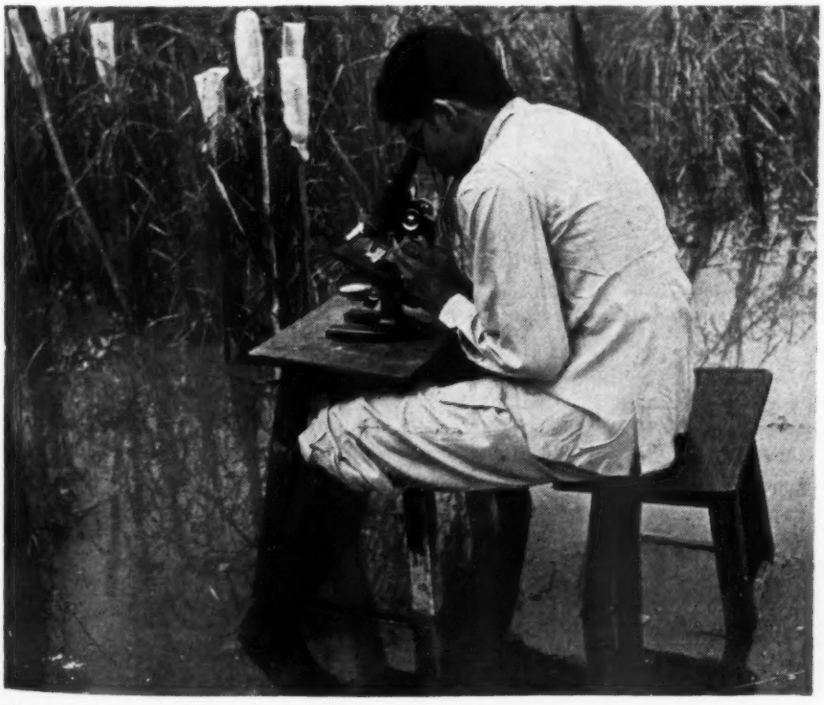
Crop	*World average (lb./acre)*	*Indian average (lb./acre)*
Rice	1,512	770
Wheat	1,064	657
Potatoes	11,200	5,720
Sweet potato	7,840	6,817

adjoining the dykes throughout the rainy season, but the peasants have not built any worth-while side canals to bring the water to their fields. Thus water, stored at great cost behind the huge dams, is distributed in a wasteful manner during the monsoon. Moreover, the farmer pays by the surface and not by the volume of water he actually uses, with the result he has no interest in its economic utilisation. The failure to extend the practice of double cropping means that the huge capital investment on irrigation is largely wasted.

However, the main difficulties are due to the human factor. Except for a few rare exceptions, the leading Indian landholders do not invest in the land, in marked contrast to the attitudes of landlords in Britain. Also, manual labour is deemed degrading by this section of the community.

The poorest type of share-cropper pays rent in kind, and the agricultural labourer, who is the backbone of Indian farming, has not got sufficient incentive to work harder. Yet to raise production a higher investment in actual man-hours by the workers is essential. Although a share-cropper is guaranteed 60% of the harvest by law, he frequently receives only a third of the harvest, although he has to find the seed, harness and implements himself. A 50 : 50 share cut is the rule, but, unlike the European share-cropper, his Indian counterpart foots all production costs. In addition to all these discouragements, usury is still the greatest bane of Indian farming, the more so as the landlord himself is so often the moneylender. In fine, agrarian reforms have only scratched the surface of this fundamental problem. They have lamentably failed to arouse among the peasants the enthusiasm essential for securing their willing submission to the hard toil which they alone can provide.

Sample types of rice from eight of the countries participating in the Rice Hybridisation Project at Cuttack. The use of improved seeds is one of the ways in which agricultural production can be improved in India



Rice Hybridisation Project at Cuttack, India, where nine nations participate in the FAO scheme for improving yields of rice. Note the isolation of the heads of paddy for controlled pollination to produce new hybrids

What needs to be done

How are farming matters going to be straightened out? In 1947, following the partition of the sub-continent into the twin dominions of India and Pakistan, 82% of the wheat and 68% of the rice-growing area in this sub-continent was India's share, yet, according to the Food Grains Enquiry Committee, imports are now of the order of £110 million per annum.

Is it possible for India to look after her mounting population without importing still more food in the future? The amount of cultivable land in India is around 280 million acres and *the country still has 85 million acres of arable waste not yet put to use.*

The low milk yield of the indigenous cow indicates that selection, efficient breeding, adequate feeding, production of nutritive feed and fodder crops and other good management practices have not yet found a place in the production of this basic human food.

Transplanting rice seedlings, Malabar, South India. Rice production, according to the author, could be increased six or seven times

The milk yield could be stepped up considerably.

Again, there is ample scope for increasing the output of the two major cereals—rice and wheat—six to seven times. This could be brought about by the optimum use of fertilisers, use of improved seeds obtained through careful selection and hybridisation, by the application of the right amount of water at different stages of growth, by the effective control of pests and plant diseases, by mechanisation, by soil and moisture conservation and other modern practices.

Of these factors, the application of fertilisers and manures is the first requirement for stepping up production quickly. Because of pests and plant diseases, a crop loss of £450 million occurs every year. This can be prevented by developing disease-resistant varieties of seeds, by changing farming methods, by seed treatment, by soil treatment and pest control. Dusting or spraying of crops in the field and in storage could appreciably reduce the losses.

Other major elements in food production are the subsidiary crops, such as tapioca, potato, sweet potato, banana and papaya, where not only is the yield per acre much greater than for rice and wheat, but also the return in terms of carbohydrates, protein and total calories is greater. It should pay handsome dividends to extend the acreage under these crops in India.

Responsibility where it belongs

The primary responsibility for executing the agricultural programme depends on the individual State Governments. Unfortunately, during the past decade few of them have taken their responsibilities seriously. Dependence on the Central Government for making up any food deficits and pretended conformity to the all-India food policy has allowed the State heads to adopt a passive attitude with a tendency to throw the blame on the Central Government when things go very wrong.

If the Third Plan targets are to be realised, the responsibility must be placed where it belongs—on the constituent units of the Indian Republic, for it rests with them to take all the necessary measures to achieve the goals with, of course, the co-operation of the Central authorities.

Gypsum for Heavy Soils

The untreated heavy grey and brown soils of the Riverina district of south-east Australia form impermeable surface layers and crusts when irrigated. The water lies on the surface for long periods, making effective irrigation extremely difficult and sometimes impossible. The soils are otherwise fertile and comprise a large proportion of the land which could be irrigated from the 1,800,000-acre ft. of water from the Snowy Mountains scheme.

The Australian Commonwealth Scientific and Industrial Research Organisation discovered that one way of improving such soils was to add massive applications of gypsum (calcium phosphate), but the cost is prohibitive.

Further experiments have, however, shown that by using low concentrations in the irrigation water to prevent dispersion of clay the cost of treatments could be reduced.

Gypsum is relatively insoluble in water, so a machine was designed to produce a solution of twice the concentration required, which can be diluted with an equal volume of untreated water to give an overall irrigation flow of about 4 cu. ft. per second, and so irrigate 10 acres in eight hours.

This approach to the reclamation of sodio soils, based on the addition to irrigation water of the minimum amount of electrolyte needed to maintain flocculation of the particular soil, has not previously been applied in irrigation agriculture.

The Dutch Created Holland

There's an old Dutch proverb that says, ' The Lord created the land and the water, but the Dutch created Holland '. Their country is one of the most densely populated in the world with over 11 million people living in 13,000 sq. miles, or 861 per sq. mile. Thus they are forced to reclaim land from the sea in order to live and the classic example is the region of the Zuyder Zee, where a total of 300,000 acres has already been converted into fertile farm land. An additional 250,000 acres are to be reclaimed in the near future.

Today acres of wheat replace the tidal waters of the Braakman creek and *International Harvester* combines have been used to harvest the first wheat crop.

A roadside demonstration field of a Young Farmers' Club in Lancashire. White pegs mark the corners of the plots, which are labelled with the appropriate treatments

Fertiliser Demonstration Fields

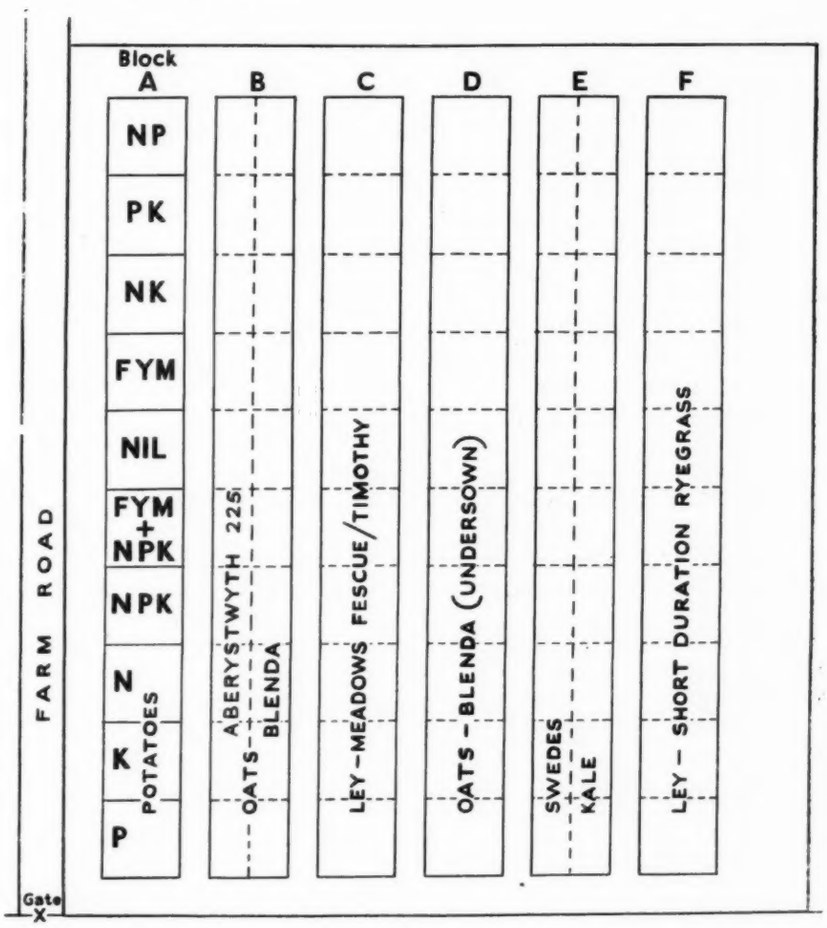
Co-operative Scheme for Young Farmers

W. D. CARSON*

Wherever efforts are being made to increase agricultural production the increased use of fertilisers is being recommended. This is an account of a scheme for encouraging the wider and more efficient use of fertilisers in Britain, which could well be followed in other countries.

FERTILISERS are essential for raising farming output and farmers' incomes, and existing standards of living cannot be maintained without the increased use of these basic raw materials of modern farming. There is still scope for the increased use of fertilisers in Britain and demonstrations on the effect of the three main plant foods on crop growth are an important means of encouraging increased usage.

The Technical Advisory Service of Fisons Fertilizers Ltd. decided in 1956 that long-term fertiliser demonstration fields would be a real asset to the farming community. Several semi-permanent demonstration fields were inspected in Holland and Belgium, but it appeared that these fields were



The layout of a typical demonstration field. The six blocks are cropped in rotation Plant nutrients applied to each plot remain as indicated for the six to eight years of the demonstration, but the quantity is adjusted to what is regarded as the most profitable level for each crop

* Agricultural Technical Manager, Fisons Fertilizers Limited

Left: *The whole of the field work is carried out by the club members, seen here preparing to plant potatoes.* Right: *Fertilisers are accurately weighed for each of the 60 plots and the members apply them uniformly to the limits defined by the strings*

visited by comparatively few people, often because they were not located in sufficiently conspicuous positions. It was also obvious that there would be some advantage in having a number of such fields operated by groups of farmers or young farmers, thus spreading the interest and varying the conditions, rather than one central station officially administered.

This prompted the idea that Young Farmers' Clubs might be willing to co-operate in such projects. But would they be interested? Would they be able to locate and hire suitable sites? If so, could they cope with the work and maintain the interest over a period of several years?

Clubs approached

In order to test the feeling of the clubs, those in certain selected areas were informed of a scheme in which the sponsors offered to provide the funds to hire and cultivate the land, as well as supply the fertilisers, seeds, spray chemicals and fencing material. In addition, technical supervision and guidance on the layout and with the seasonal operations would be provided. The club members would be solely responsible for the day-to-day operations and the treatments would be continued over a period of five or six years to reveal the cumulative effects of the various fertilisers on the rotation of crops usually grown in the area. Clubs which were interested were invited to complete a proposal form detailing the site available and the reasons why the members wished to run a fertiliser demonstration field.

The response was magnificent. Over 50 clubs indicated their desire to participate. These were visited by Fisons technical staff to explain the project more fully and inspect the sites offered. Twenty-eight clubs throughout Britain appeared to have sufficient members with the enthusiasm to cope with the work involved and with one senior member to act as leader of the field team. They had sites which were level, with uniform soil type and prominently situated.

The project was off to a good start and after three years there are no indications of waning enthusiasm. Though the summer activities involve a good deal of hard work, there are many willing hands and it is no uncommon sight to see 15-20 members busy at seed time and harvest and during the occasional clean-up prior to the visitors' day, to which parents and neighbouring clubs are invited. This usually takes place in midsummer, when the contrasts between the various fertiliser treatments are most pronounced. The officer responsible for technical supervision is present to explain and discuss the results based on observation.

Method of recording

The more progressive clubs record the yields of those crops which are easily weighed, such as potatoes, swedes and kale, together with observations on the crops during the growing season. These notes include details of the spray chemicals used to control any weeds or insect pests. Trials with the behaviour of new varieties of cereals and different grass seed mixtures are also carried out.

In many instances colour slides are obtained of the more vivid contrasts due to different treatments, and, together with the field records, these form the basis for a useful discussion meeting during the winter, when plans are made for the following season.

The project is a lively centre of interest throughout the year and over several years, providing the members and their parents with much information not easily obtained in normal farm practice. Above all, they see the value of the three main plant foods, singly and in combination, on the usual crops grown in the area and under their own climatic and soil conditions.

Layout

The plan of the field is simple, as can be seen from the diagram, and is designed to show:

(*a*) The value of balanced fertiliser treatment, at what is considered to be the optimum economic level, on the crops normally grown in the district with, or without, farmyard manure; this is applied, as is usual in farm practice, only to the areas devoted to roots or green crops.

(*b*) The effect on crop growth of omitting one or more of the main plant nutrients.

The field is divided into six blocks and these are cropped in rotation, which may be:

Two or three years' temporary grass, using different seed mixtures on each block.

Oats or barley, which may be of two varieties.

Swedes, potatoes or green crops, or two of these.

Oats or barley (undersown).

Each of the six blocks receives 10 different fertiliser treatments—the individual plots being approximately 1/60th acre—and each plot receives the same fertiliser treatment annually. In this way the differences in crop growth due to a continued omission of one or more of the plant foods can be studied

and compared both with the plots which are given no fertilisers and with those on which the fertility is being increased by annual applications of nitrogen, phosphate and potash.

The rates at which N or P or K are applied corresponds to the quantity used on the plots receiving NPK in the form of a complete granular fertiliser. The plant food ratio of this fertiliser and the quantity used is related to the soil type and the crops concerned. Great care is taken to see that the fertilisers are applied uniformly and to avoid wind drift. The sharp distinctions between the treatments indicate that the members responsible realise that the value of the whole project depends on the accuracy of their work at planting time.

Results

Though the demonstrations are primarily for observation, and there is no replication of treatments to satisfy the statistician, keen club members like to weigh the crops wherever possible and may use this information to assess the economics of the treatments. The following yields were obtained by the Forton Y.F.C. in Lancashire on a light, sandy soil in 1959, the third year of the project:

Table 1

Comparative yields

	Kale		*Potatoes*	
	Tons	*Cwt.*	*Tons*	*Cwt.*
NP ..	16	17	3	14
PK ..	25	12	14	2
NK ..	31	18	12	19
FYM..	22	5	11	2
Nil ..	19	10	4	16
FYM + NPK	32	9	16	6
NPK..	34	17	18	11
N ..	20	15	5	11
K ..	15	4	12	19
P ..	16	6	3	10

Varieties: Kale, Marrow Stem. Potatoes, Redskin.

Yield data from the blocks which are in grass are more difficult to obtain and because they must be mown year after year the results are not comparable with normal farm practice where the ley is usually grazed for one or more years. Nevertheless, the influence of potash in association with phosphate on the development of clover is quite outstanding at all stages of growth and confirms the results in Table 1 for the kale and potato blocks at this same site. Indeed, all of the 28 demonstration fields which have been running for three years or more show a marked visual response to phosphates and potash on all crops and the plots which do not receive such treatment are, as would be expected, producing at a very low level.

The future

This unique project—probably one of the most comprehensive ever tackled by any Young Farmers' Clubs—has given its sponsors considerable satisfaction and provided the clubs with first-class background information, practical experience with fertilisers and an idea of what crops look like when deprived of sufficient nitrogen, phosphate and potash. They will be able to identify, almost as experts, the crop symptoms created by a deficiency of any of the major nutrients. These are now unlikely to occur on their fathers' farms because of the knowledge gained from seeing the effects of adequate and balanced fertiliser treatment in the demonstation plots of the young farmers.

The effect of potash on clover growth on a light sandy soil is seen in the PK plot where no nitrogen was applied

Land Reform in Cuba

Under an Act which came into force in 1959* the maximum amount of land which may be owned by any person or corporate body in Cuba is limited to 30 *caballerias* (about 1,000 acres). Lands exempted from this provision are: (1) all sugar-cane and rice plantations, the yields from which are 50% above the national average; (2) livestock breeding areas under specified conditions; and (3) areas sown with one or more crops or used for agriculture and livestock breeding, for whose efficient exploitation it is necessary to maintain an area in excess of 1,000 acres.

The Act forbids share-cropping contracts (except in the case of sugar-milling contracts) and the operation of sugar-cane plantations by individuals who are owners, shareholders or employees of an undertaking engaged in the manufacture of sugar. In future, landed property may not be acquired by persons other than Cuban nationals, or by companies other than those formed by Cuban nationals.

Expropriated land will be distributed to occupier farmers and compensation to landowners whose property is expropriated will be payable in redeemable land reform bonds issued by the Cuban Government, bearing interest not exceeding 4½%.

A National Agrarian Reform Institute will be responsible for implementing the Act, its duties including administration, advice and agricultural research.

* Cuba: Agrarian Reform Act—17 May, 1959 - *Gaceta Oficial* (*Edición Extraordinaria Especial*) No. 7, 3 June 1959, p.1.

Green Gold

Bananas in the Windward Isles

A. BOLT

Planting a young banana sucker of the Lacatan variety

IN the Windward Isles bananas are known as 'green gold'. Picked and shipped when green, the fruit has in the last five years made an important contribution to the economy of these Caribbean islands and the value of banana exports now surpasses that of sugar.

Associations of Banana Growers were formed in Dominica and St. Lucia in 1934, but it was not until 1954 that St. Vincent and Grenada founded similar organisations. In that year Geest Industries entered into an agreement with the four associations, which has been of inestimable value to these beautiful tropical islands which were economically bankrupt.

Banana production, however, means much more to the islands than good and quick money. Apart from increased employment for agricultural workers and cash for the peasant farmers, it has produced better roads, new wharves and equipment, improvement in shipping facilities and the building of stores and collecting depots and led to considerable investment in trucks, farm machinery and other equipment.

On larger plantations fertilisers are used: ½ lb. when the young suckers are two months old and a further 1 lb. at six to eight months. The fertiliser used is a 5:10:10 mixture

The Gros Michel strain of banana is particularly susceptible to Panama disease, so most Windward Island plantations are now of the Lacatan variety. This variety is liable to leaf spot and it is usual to spray them every three weeks. Here a Micron sprayer mounted on a Land-Rover is seen in action

In Dominica the Colonial Development Corporation run a large estate which includes over 300 acres of bananas and, since they were able to guarantee a large output of high-grade fruit, they were largely instrumental in making it worth while for refrigerated ships to call at the island, with consequent benefit to many smallholdings which do not produce enough for

If each individual stem is tied up in a perforated bag of cellulose film, not only is the spread of disease avoided, but the risk of bruising is greatly reduced

Left:

Harvesting the crop. Though stems over 100 lb. in weight are not uncommon, 25 lb. is the average

Right:

All bananas are not exported and this Carib woman is taking her bananas to the local market

The bananas are carried on the head from the field to the waiting trucks, which are lined with leaf trash to prevent bruising the fruit over the bumpy mountain road

Where there are no deep-water quays the bananas are ferried out to ocean-going ships in lighters, the fruit being protected from the tropical sun by a covering of dried banana leaves

export in commercial quantities.

A trans-insular road has now been built and it was something of an engineering feat to cross the central mountain spine where the annual rainfall exceeds 300 in. This road will open up areas on the other side of the island and a new Colonial Development Corporation estate at Castle Bruce is to put several hundred more acres under bananas. It is not possible to ship from this side of the island, as there are no suitable harbours and it is the windward coast.

On this island there is a reserve for the Caribs, a once war-like tribe which was decimated by the Spanish and practically exterminated by successive waves of French and British colonisers. These people also benefit from the banana boom and from smallholdings in their reserve; they walk over the mountains to deliver their bananas to the nearest reception centre. Today bananas account for 65% of Dominica's total exports.

In Grenada, bananas are valued as a catch crop and are widely used as temporary shade during the replacement of moribund orchard crops, such as cocoa, by new and improved strains. During the initial years, when there is no income from the orchard crops, the planters can realise their 'green gold' and banana exports from Grenada have grown from 92,000 lb. in 1954 to over 26 million lb. in 1959. The Windward Isles suffer from storm and hurricane damage and when replanting coconuts and other slow-maturing trees, bananas (which can be reaped after 11 months) have saved many farmers from ruin.

St. Lucia has more than quadrupled her banana output. Sugar, once the mainstay of its economy, has the great disadvantage of providing employment for only a few months of the year. Although bananas have a peak season, there is a fair level of production throughout the year.

St. Vincent is the last of the Windward Isles to turn to banana cultivation on a commercial scale and it has been found here that banana suckers can be planted between the rows of coconuts with benefit to both crops. The turning of the soil and consequent disturbance of the palm roots appears to improve rather than upset the coconut crop. While in 1952 there were no banana exports, last year over 35 million lb. were shipped and accounted for some 45% of the total exports. Thus it is not surprising that throughout the Windward Isles bananas are affectionately described as 'green gold'.

Better Seeds — Better Crops

A world campaign to encourage the use of better seeds has been launched by FAO as a means of increasing agricultural output and world food production. 1961 has been designated as an International Seed Year, during which special seed improvement campaigns are to be conducted in member countries.

The campaign in the U.K. will have two main features: the provision of educational courses for representatives from the less developed countries and a drive for the wider use of high-quality seed of improved crop varieties.

A six-weeks' course in seed testing and certification is being arranged at the National Institute of Agricultural Botany at Cambridge for up to 20 representatives from the overseas countries. The Ministry of Agriculture for Northern Ireland is offering practical training to overseas students in seed testing and certification. The Department of Agriculture and Fisheries for Scotland will be providing facilities to enable foreign visitors to learn about the seed testing and certification work carried out in Scotland. The Forestry Commission will also be participating, as far as possible, in respect of forest tree breeding and seed production.

A National Crop Conference is to be held at the N.I.A.B. in December 1960 and will have as its theme 'Better Seeds: Better Crops'.

The 'Cushioncraft' riding on its cushion of air, ready for take-off in the required direction

Riding on Air

Agricultural Vehicle of the Future

F. C. COOKE,* B.SC., A.M.I.CHEM.E.

Is this banana transporter a waterplane, a hydroplane, a flying saucer, a motor boat, an amphibian or a combination of all of these? It travels over land and water on a cushion of air without actually taking to the air. It is yet another new invention in an age of agricultural revolution.

BANANAS are a very vulnerable crop and many problems have to be overcome to make sure that they reach the consumer, not only in a sound condition, but also with good 'eye appeal'. They must be a ripe golden yellow and they must also be without blemishes. It is not enough if the fruit itself is in perfect condition within if the outside of the fruit—the skin—has unsightly markings and black patches caused by vibration and rough handling. These markings will reduce the value of the consignment and result in appreciable financial losses.

Improvements in shipment

Over the past 60 years many improvements have been made to ensure that the bunches of fruit arrive in Europe in a sound condition, ready to go into the ripening rooms. But the problem has remained that fruit received apparently in perfect condition will subsequently develop black markings in the maturing rooms.

This new agricultural vehicle will carry three men and a consignment of bananas on the loading platforms. The 40 rotors and the two propellers together lift and direct the craft

* Formerly Head of the Pineapple Research Station, Johore, Malaya.

The banana ships carry cargoes of some 150,000 bunches to Europe in about 10 days. Each stem of 'hands' is carefully wrapped in perforated diothene tubing prior to shipment to reduce the scarring and bruising that might occur during the voyage, and the holds are sectionalised to prevent the movement of the stacked fruit during rough weather. On arrival at the home port the bunches are smoothly unloaded by electrically-operated elevators and overhead conveyors into special railway trucks and lorries for transportation to the ripening rooms of the wholesalers, where the fruit changes from green to yellow.

The remaining problem

The problem of external blemishes, which still remains, is not made any easier because the black markings are not visible while the fruit is green. The bruising mostly occurs when the fruit is being carried through in the banana fields and while the bunches are being transported by lorry down to the coast.

The lorries have to travel through the plantations over rough unmade roads and in the wet season they may get bogged down owing to heavy tropical downpours and can only extricate themselves with difficulty. Where there are no roads boats have to be used; however, a river which may be navigable in the wet season is often reduced to a mere trickle in the dry season—this means a close season. Sometimes the rivers are so choked with weeds as to be impassable, or else time is lost because of frequent stoppages of the propeller through weeds.†

Its solution

With the object of getting the fruit to the wharf with the minimum of damage, to save road- and bridge-building costs, and avoid long lorry runs over indifferent or bad estate roads, *Elders and Fyffes Ltd.*, the well-known shippers, have sponsored the construction of a remarkable new farm vehicle—the 'Cushioncraft'—a vehicle which literally rides on air in the same way as a boat rides on water. The prototype was recently demonstrated by its makers—*Britten-Norman Ltd.*‡ —at their works at Bembridge airport in the Isle of Wight. Its possibilities are being studied both in Britain and in countries overseas with the object of doing away with the use of lorries and transportation by river craft. For the new plantations in the Cameroons alone, it is estimated that 15 of these machines will be required.

A simple machine

The prototype, although looking like a flying saucer, is actually a quite simple machine, consisting of a circular casing which houses the rotor, and its 40 blades create the air pressure under the machine which lifts it clear of the ground. There is a relatively small power unit—a Coventry Climax sports car engine, giving up to 170 b.h.p., which drives the rotor and also two twin rear-mounted propellers, which push, pull or turn the craft as required. So simple is it that only two controls are needed—a combined hand throttle and clutch to engage the rotor and a steering wheel which can be pulled backwards or forwards or turned. To move forwards the driver pushes the wheel and to reverse, he pulls it back; to move left or right he turns it in the same way as a car steering wheel.

Cushion of air

In effect the 'Cushioncraft' is an inverted circular box, 19 ft. in dia., into which air is driven by the rotor; as the air pressure within it rises the box lifts, so allowing some of the imprisoned air to escape; the air so lost is constantly renewed until, when the box is between 12 and 15 in. above the ground, a balance is reached and the machine cannot rise any higher.

The initial studies and trials have shown that the small prototype machine can lift a load equal to its empty weight, which is 1 ton, to a height of about a foot. The craft is, in fact, like a smooth oval pebble resting on a film of water on a sheet of smooth ice. Once airborne it can be made to move in any desired direction at speeds of up to 50 m.p.h. by means of its twin propellers. It needs a semi-prepared track to be cleared through the jungle or it can pass over a relatively smooth sheet of water, such as a lake or a small river.

The cost per lb. of basic weight to build such a machine is not expected to exceed that of a simple light aircraft and with large-scale production it will approximate to that of a motor lorry. It thus appears to be a practical proposition with enormous possibilities, since it will open up inaccessible lands for development where roads are non-existent or where a barrier of swampland prevents access to fertile lands in the interior.

Quickly perishable crops

Another application which suggests itself is the transport of ripe pineapples from field to cannery. The finest canned pineapple is canned ripe, but ripe pineapples are far too easily bruised, and once bruised cannot be kept because fermentation rapidly sets in and in a few hours the fruit is unfit to use. The losses can indeed be enormous. The difficulty is partly overcome by using unripe fruit, which is firmer, but this gives a much inferior product.

Similarly, oil palm fruits, if bruised, develop acidity, which reduces the commercial value of the extracted oil. It would be better to carry the heavy bunches on air than bump them in carts along rough tracks.

Liquid latex, too, in the raw state needs to be processed without delay, and where paths are the only means of communication such delays can occur. However, nothing more can be stated about the performance and possibilities of this interesting new form of transport until it has been used under field conditions and further news will be awaited with interest.

† See 'Eradication and Control of Water Hyacinth', WORLD CROPS, 1958, **10**, 286.

‡ The Britten - Norman 'Micronair' equipment for aerial spraying was described in WORLD CROPS, 1959, **11**, 415.

Flame Gun for Paddy

We have received an enquiry from a reader in Surinam, Dutch Guiana, for an economical flame gun to be used in wet paddyfields, equipped with a flame boom able to clear a 12-in. or 16-in. wide path in one trip. The gun must be light enough to be carried easily by one person in muddy fields and must contain enough fuel to be used for about one hour continuously.

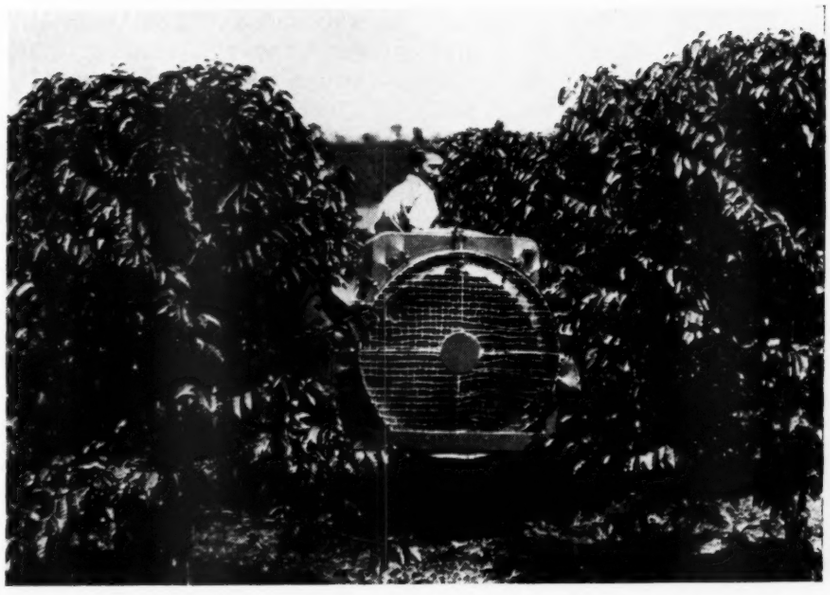
Manufacturers of flame guns which could be used in the way described above should send particulars to the Editor.

Rust Disease of Coffee

4—Control by Fungicide

R. W. RAYNER, B.A., A.I.C.T.A.

After a brief review of work elsewhere, the author gives an account of recent investigations in Kenya.



An 'Autoblast 4' air-blast spraying machine being used in coffee at the Coffee Research Station, Ruiru, Kenya

THE breeding of resistant coffee varieties as a long-term policy is likely to prove the most satisfactory method of controlling coffee rust. However, as new resistant varieties are bred, so hitherto unknown forms of rust may appear and attack them, either because their existence may not have been detected earlier, or because a new form may have developed by mutation.

Furthermore, it will be many years before the old susceptible varieties of coffee are replaced by resistant ones. In the meantime, some other method of control is needed as a second string. It has been found that, provided climatic conditions are not too favourable to the disease, as they are in Ceylon, a useful degree of control can be obtained by the use of fungicides.

Early work

Once again Marshall Ward was first in the field, showing that a lime sulphur spray could produce a degree of control. It is true various other chemical methods had been suggested earlier, such as placing containers of carbolic acid in the plantations, but many of these were more reminiscent of alchemy and wizardry than the application of scientific knowledge. He pointed out that control by chemical means must deal with the fungus whilst it is still in the accessible stage of growing on the surface of the leaf, for once it has penetrated it is not likely to be effective.

As early as 1886, Bürk found that a copper-containing spray similar to Bordeaux mixture gave some control of rust, but the true Bordeaux mixture was not discovered until the following year. It appears to have first been used in India only in 1926. Bordeaux mixture and other fungicides have since been very widely employed for rust control with varying degrees of success and are now extensively used in India, Kenya, Tanganyika, the Belgian Congo and other countries.

Indian investigations

Until recently it was only in Southern India that extensive investigations of rust control by fungicides had been carried out. They were initiated by W. W. Mayne and are still being pursued. Reviews have been written by Mayne, Narasimham and Sreenivasan[12] and more recently by Ramanathan, Ball and Thomas.[13]

It was found that the correct timing of the spray applications was the most important single factor affecting success. In Mysore there is a single long rainy season from June to November, commencing with the south-west monsoon, when most of the rain falls, and continuing through into the north-east monsoon. A spray in May at the time of the blossom showers, before the onset of the south-west monsoon, was recommended and a post-monsoon spray in September, as soon as possible after the monsoon, was considered to be a useful addition.

Little attention seems to have been given to the volume applied per acre and it would seem that spraying to 'run-off' was almost invariably employed. Nor does there seem to have been much interest in the method of application, high-volume apparatus pumped by hand being usually used. More recent work, however, suggests that low-volume spraying does not produce as good results as high-volume applications.

Several studies of the effects of concentration have been made, but these have been largely directed to determining whether lower concentrations than the standard 1% Bordeaux* could approach this in efficacy, the aim being to economise copper rather than obtain maximum efficiency of control. It must be remembered that the price of coffee was very low at the time.

* A mixture containing 1% copper sulphate — 4 lb. of copper sulphate and 4 lb. of lime in 40 gal. of water

It was concluded that ½% or even ¼% concentrations could give worthwhile control with relatively little loss in efficiency.[14] On the basis of effects on yield, little difference between the ½% and 1% concentrations could be detected. George[15] has more recently reported an upward trend in rust control with increasing concentration in the range ¼-½%, however.

Various spreaders and stickers, such as linseed oil, casein and Teepol, used as additions to Bordeaux mixture, were tested and, although there appears to have been evidence of increased efficiency in some cases, no very clear-cut results were obtained and apparently such materials are not used in practice.

Various copper fungicides other than Bordeaux mixture, have been tested, but nothing giving greater efficiency has been found. In more recent tests Perenox, Shell Copper, Dithane, Blitox and Captan have been tried. Mainly the materials were found to be as good as Bordeaux, but some (notably Dithane) were inferior. None were better.

It can be concluded from the Indian work that for efficient rust control a good high-volume, high-pressure spray should be used to apply a ½% concentration of Bordeaux mixture at the onset of the south-west monsoon rains, and again after they have finished. Crop increases as a result of spraying of the order of 60-70% have been reported.

Recent work in Kenya

Dowson[16] reported the first investigations in Kenya in 1921 and recommended that ½% Bordeaux or Burgundy mixture be applied at the beginning of the April ('long') rains, and again as they finished. An application of 1% was recommended for lower altitudes. McDonald,[17] his successor, made basically similar recommendations, but the experimental evidence does not appear to have been published.

This was the position as the writer found it in 1941. Following a series of years of low coffee prices during the 1930's, interest in the control of leaf rust by spraying had declined and it was rarely practised. The steep rise in coffee prices in recent years resulted in efforts being made to maintain the estates at a high level of production and this policy included the control of rust.

In addition, the climate has been rather favourable to the disease and together with the recent developments in the design of spraying machinery, especially as regards the use of air-blast sprayers, has stimulated considerable interest in methods of chemical control. In the changed circumstances reliance on recommendations based on work carried out many years previously and in other countries could not be continued.

Photo: G. J. Rose, Micron Sprayers Ltd.

A Micron 'Meg' being used on coffee in Kenya

A series of trials to explore the effects of the main variables in spray application on rust control were accordingly initiated in 1957. The variables investigated were concentration, volume sprayed per tree, surface of leaf on to which the spray was directed, the effect of various fungicides, methods of application and the timing. There were four trials, one of which was repeated in a second year. They were factorially designed, so that the effects of several factors at a time could be investigated and their interrelations determined.

They were designed to test effects on rust incidence alone; effects on yield were not determined, as to do so would have reduced the efficiency of the measurements of rust. In order to make the trials as sensitive as possible, alternate trees only were sprayed in all but one of the trials, rust incidence being also measured on these unsprayed trees.

Comparison of different fungicides

As investigations elsewhere had not indicated that other materials were likely to give better results than copper fungicides, attention was largely concentrated on these. The main materials used for spraying in Kenya at the time were commercial products based either on cuprous oxide or copper oxychloride. Perenox and Blitox were tested as being representative of these two types. Burgundy mixture was chosen as a standard, as it could be made with readily available good-quality chemicals.

In one trial, Perenox was compared to Burgundy at four different concentrations: ¼, ½, 1 and 2 % of the former, the Perenox concentrations being the epuivalent copper contents (*i.e.* 1.25, 2.5, 5 and 10 lb. per 100 gal.) No real, overall difference could be detected, although the trial was sufficiently sensitive to have indicated a difference between 5 and 6½ lb. of Perenox in 100 gal. There was some indication however that Burgundy reduced the level of rust attack for a longer period.

In a further trial, in two successive years, no real difference between Burgundy, Blitox and Perenox could be detected. A difference between 5 and 11.3 lb. in 100 gal. in one year, and 5 and 10.5 lb. in the second year was likely to have been detected. The evidence was thus against there being any significant differences in the efficiency of these three fungicides. In a small test of Ferbam (ferric dimethyldithiocarbamate) and Captan, the former did not appear to be as efficient as the copper sprays. Captan (1 lb. in 10 gal.) was as good as ½% Burgundy for rust control. However, there was evidence that as well as reducing the leaf shedding due to rust control, the copper sprays had additional effects on leaf shedding not shared by Captan. As these additional effects are likely to be associated with yield increases, this is a strong point in favour of copper sprays.

Spray concentrations

In all the trials, strong effects of concentration were found and there was no indication over the range investigated (equivalent to ¼ and 8% Burgundy) that further increases would not result in greater rust control. However, for each equal additional decrease in percentage of leaves rusted, the concentration had

to be doubled, *i.e.* the relation was exponential. In practice, to determine what concentration should be used, the cash return in crop will have to be considered as well as the phyto-toxic effects of high concentrations. It would seem, however, that there is a good case for using considerably higher concentrations than in the past.

For high volume application, a 2% spray would probably be worthwhile, instead of the ½% used previously. Yield trials will have to be carried out, however, before a firm recommendation can be made. The difference from the Indian findings is striking, but of course conditions are very different.

Volume per acre

If the concentration was kept constant, increasing the volume of spray applied per acre by increasing the rate of spray emission was found to give improved rust control for each of the three machines tested. This was found, however, to be a less efficient way of utilising additional spray chemical than by increasing the concentration.

It was found that when the amount of fungicide received on the leaf was increased by increasing the volume per acre sprayed, this was somewhat less effective in producing rust control than when this was done by using higher concentrations. It would seem that increasing the area of leaf covered by the fungicide is less important than has been thought to be the case, and that increasing the thickness of the deposits which must be the main effect of increasing concentration, is at least as important, if not more so.

Method of application

As was pointed out earlier, the fungus spores must germinate on the lower surface of the leaf if they are to produce infection. For this reason, the importance of obtaining a good deposit of fungicide on this surface has been emphasised by many workers over the years. No one however seems to have determined whether this does in fact produce the best results.

From a consideration of how rust spores reach the lower surface and from the observation that washings from the upper surfaces of leaves sprayed by fungicides could prevent germination of spores, the writer considered that upper surface cover might conceivably be quite efficient for controlling infection. Further, it has been shewn that under the action of rain, redistribution of copper deposits can occur, copper being removed from one part of a leaf and deposited again elsewhere.

Contact coffee spraying in Kenya using a high-volume, tractor-drawn machine supplied by Fisons Pest Control Ltd.

In consequence, in two trials, in which hand sprayers were used, the effect of directing the spray onto the upper or the lower surfaces of the leaves was compared. In both, the overall effect at a number of different concentrations was not found to differ significantly, though in one trial, spraying of the upper surface at the lower concentrations was somewhat less effective; at the highest concentration (2% Burgundy or equivalent) both surfaces gave equally good control. These results agree with similar findings on the control of potato blight.

An interesting development, which is thus suggested, is that aerial spraying to control rust may have practical possibilities, especially since the indications are that high concentration sprays are effective. For some time, this idea has appealed to the coffee growers in Kenya as large areas of closely-planted coffee could be easily and rapidly sprayed by this method. The requirement of good under-leaf cover, which was previously thought to be essential, had however discouraged attempts at control by this means.

Means of application

Three different types of apparatus were compared. These were a pneumatic hand sprayer, working at 60 lb./sq. in., and two air-blast machines, one of which used swirl-plate nozzles for atomisation and the other a spinning cage. A range of rates of spray fluid application were used appropriate to each machine, and the concentration was varied from the equivalent of 2%–8% Burgundy mixture.

The relation of pounds of fungicide sprayed per acre to rust control for the hand sprayer and the spinning cage machine was found to be essentially the same, though much higher amounts could be applied by the latter. Considerably less control per unit of fungicide sprayed was however found for the swirl-plate machine. This was largely due to its lesser efficiency in delivering the fungicide to the leaf. For equivalent amounts of fungicide on the leaf, the two air-blast machines were found equally effective, whereas hand-spraying was rather more effective.

By far the greater proportion of the differences between the rates, concentrations and machines could be ascribed to the different amounts of fungicides received on the leaf. In fact, it would appear that if the machines were adjusted (via emission rates and concentration of fluid sprayed) to give equal amounts of fungicide on the leaves, very much the same degree of control would be

obtained. If this is found to be of general application, the assessment of the correct rates and concentration for different machines may be relatively simple to obtain without resort to lengthy and laborious biological determination.

It was calculated that to obtain the same degree of control as with hand-spraying at 2% and 2 pints per tree, the swirl-plate machine should be used at 100 gal. per acre and 8% concentration, and the spinning cage machine at 7½% and 30 gal. per acre.

Timing the applications

From the observations described in the first part of this series, the level of rust incidence present in January to March and the degree of infection which occurs at this time would appear to determine the degree to which build up of rust infection to a peak in August will take place. It follows that control of rust infection by spraying before the October ('short') rains, which should reduce the amount of rust in January, might control the size of the August peak. Further if rains occur at this time, a spray before they fall might have a similar effect.

If such effects occur, the effectiveness of the sprays would probably be determined by the size of the area sprayed, as the degree of spread of inoculum from unsprayed trees would play a part. Some observations in the field had suggested this spread might be less than supposed for an air-dispersed fungus. For this and other reasons, the effect of reducing the within-the-tree inoculum by spraying individual trees, interspersed with unsprayed trees, was tried in the first place. The degree of infection during the April ('long') rains would naturally be expected to be controlled by a spray applied at their onset and also at a later date before they were finished.

Sprays at all the times mentioned, *i.e.* October, January, March and April, and combinations of all these were tried. They all produced reductions in the amount of rust present two to three months later. The March spray was most effective and the January least. The August peak was markedly reduced by the March spray and a useful supplementary effect was obtained by an April spray in addition. Neither the October nor the January spray had any useful effect, either alone or in combination with the others.

It is presumed that reinfection from surrounding trees soon swamped any beneficial effects of these sprays on build-up and hence a considerable spread of inoculum must occur from tree to tree, as might be expected.

It remains to be seen whether with larger areas sprayed, beneficial effects on build-up will occur from sprays applied at these times. In fact, from recent reports,[18] this appears probably to have been the case, as reduction in rust incidence by spraying before the October rains has been detected nine months after application.

Conclusions

The results of these recent investigations in Kenya indicate that some of the earlier assumptions were probably erroneous. They focus attention on the need for higher concentrations than have hitherto been employed and suggest that the emphasis in the past on the importance of obtaining the highest possible degree of fungicide cover, especially on the under-surface of the leaf, may have been overdone.

It seems to be of more importance to obtain an adequate dosage of fungicide on the leaf as a whole. This conclusion seems to be of particular importance when air-blast machines are used. Much remains to be done, however, before the results can be translated into firm, practical recommendations.

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West Goes East

A Fisons technical delegation boarding the aircraft for Moscow via Amsterdam at London Airport on 14 May. Reading from left to right they are: Dr. E. Parry Jones, managing director; Mr. A. L. Abel, technical adviser; Dr. R. K. Pfeiffer, head of Botanical Department; and Dr. G. S. Hartley, Director of Research, of Fisons Pest Control Ltd. Subsequently a return visit was paid by a delegation of Russian scientists. *See page 324*

New Publications

Economics for Agriculture

Selected writings of John D. Black. Edited by J. P. Cavin. Pp. 719. Harvard University Press. London: Oxford University Press. Price 96*s*.

This large volume contains a biography written by J. K. Galbraith and a selection of the writings of Dr. John D. Black, an American who has made it his business in life to train specialists in agricultural economics. This emphasis on his remarkable success as a teacher should not be allowed to obscure the fact that he also enjoys a world-wide reputation as an economist who in the U.S.A. has for many years exercised a considerable influence on policy in the U.S. Department of Agriculture.

Dr. Black is a prolific writer: the bibliography of his more important contributions to literature during the past 30 years covers 21 pages of this book. The task of selecting and arranging a portion of his writings for republication must therefore have been a formidable task, which has been achieved with success by James Pierce Cavin, the editor of this compendium. The editor enables the reader to perceive the author's breadth of view and ability by arranging the contents of this book in 13 parts. Each part deals with one aspect of agricultural economics and is introduced by an essay written by a former student or colleague of the economist, presenting the philosophical and historical background of the specific subject and an evaluation of Dr. Black's contributions to it.

Many of the subjects discussed in this book were written when policy was being formed; it is interesting and instructive to read Dr. Black's closely reasoned arguments in retrospect. An economist is not judged by the profundity of his conceptions, but in the light of subsequent developments. On this test, Dr. Black emerges as an economist of high repute. The book will prove of particular value to those interested in the history and development of agricultural economics and agricultural policies.

D. H. GRIST

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Ceylon Tea

Tea Manufacture in Ceylon by E. L. Keegel. Second edition, revised 1958. Pp. 179. Issued by the Tea Research Institute of Ceylon.

This book should be studied by every tea planter in Ceylon, but it can also be read with interest and profit by planters in other tea-growing countries, where the details of procedure in manufacture may differ markedly from those described.

Tea is manufactured in Ceylon by what has come to be known as the orthodox process, in which withering, rolling and fermentation are carried out in leisurely manner, followed by firing. Each phase is described in detail and in a form acceptable to the non-scientist, being assisted by diagrams and illustrations. Factory organisation and hygiene are discussed and a glossary of tea taster's terms is included in the text.

Over the past 30-odd years, fundamental changes in procedure have been adopted in tea factories in North-East India and some other countries. Such include the production of non-wither tobacco-cut teas and C.T.C. teas. Now the 'Rotovane', which rolls and distorts the leaf in a few minutes, is under trial. None of these innovations is favoured in Ceylon. This is not because the Ceylon planter is less imaginative or progressive than his opposite number in Assam. Indeed, tobacco cutters have been exhaustively tried out, the Clivemeare roller (a very vigorous leaf smasher) has been used on a large scale, the L.D.S. system, in which all the manufacturing processes are carried out in a single drum, has been investigated, and so on.

The fact is, when the traditional processes of tea-making are changed, the product loses its 'Ceylon' character, so the industry very wisely keeps to orthodox procedure.

The chemical changes going on during tea preparation are freely dealt with, as occasion demands, throughout the book and the two opening chapters are mainly on this aspect. It is with relief that we meet our old friends—the tannins—again after they have been submerged for so long within the polyphenolic group.

The author is congratulated on his masterly presentation.

C. R. HARLER

Economic Plants

Dictionary of Economic Plants by J. C. Th. Uphof. Pp. 400. H. R. Engelmann (J. Cramer), Weinheim, Germany, 1959. Price not stated.

There are many excellent works on economic plants, but all are concerned with particular aspects; there has long been a need for a universal dictionary unrestricted by geography, species or economic use. Professor Uphof must be congratulated in achieving a great measure of success in his endeavour to meet this by a comprehensive work giving brief descriptions of the world's economic plants.

The vast array of over 6,000 species covered by his dictionary emphasises man's great dependence on plants. The wide range of usage to which plants are put is well illustrated by the first and last entries: '*Abbevillea fenzliana* . ... used for jelly' and '*Zygophyllum simplex* . . . used as fodder for camels'. Between are crops producing drugs, fibres, gums, oils, spices, resins, and food for both modern and primitive man and their livestock.

Almost inevitably there are omissions which must puzzle readers interested in special aspects. For instance, the Brassicae species are notably difficult to classify and any attempt will meet with criticism. It is odd, however, to see reference to the swede as fodder for livestock, but not the turnip, to see various references to kale, but

omission of the forage kales, and the absence of the winter oil rape.

It may be valuable to note that varieties exist in certain crops, but it is clearly impossible to do more than present an arbitrary selection. On the other hand, mention of the broad grouping of varieties in the more important crops should be of use.

No doubt subsequent editions will remedy the defects and fill in the omissions which will become evident with usage. Nevertheless, this dictionary demands an immediate place in the libraries of all who are concerned with economic plants, for it brings together for the first time an immense fund of information in an easily available form.

L. A. WILLEY

Forest Fertilising

Forstdüngung by D. Brüning. Pp. 210. Neumann Verlag, Radebeul, Germany, 1959. Price DM 25. (In German, with Russian and English summaries.)

'Forest fertilising' is a considered assessment of some German research and trials on the results of fertiliser application in forestry. No one would now dream of questioning the value of fertilisers in the production of agricultural crops, but forest fertilising is a comparatively recent innovation and doubts and uncertainties still exist regarding its economic value and efficiency. However, there is a steadily growing body of opinion among foresters throughout the world that fertilisers will become more and more important in increasing timber yields and shortening the rotation period. Fertilisers, it is thought, will soon be an accepted silvicultural tool, not only in forest nurseries and in establishing young plantations on poor sites, but also in certain adult stands.

The trials which Brüning discusses refer mainly to Scots pine, *Pinus sylvestris*, robinia, *Robinia pseudoacacia*, and red oak, *Quercus borealis*, and the effect of K and Mg. fertilisers on their development. Full and extensive details of height and volume increments are given and results contradict 'the widely spread view that potash fertilisation is not required in forests'.

A striking feature of Dr. Brüning's book is the large number of excellent coloured photographs it contains. These are most useful and valuable, for they show, in the clearest and best possible way, deficiency symptoms and the contrast between the foliage of fertilised and unfertilised trees. No amount of text could replace them. The coloured photographs are supported by numerous black and white illustrations and much tabulated and graphical information. Though the English of the summary is quaint, it is adequate and comprehensible; the stately German text itself contains a mine of useful information and experience.

W. LINNARD

Irrigation Conference

Cambridge Irrigation Conference, Report. Pp. 40. Farm Intelligence Ltd., 42 Parliament Street, London, S.W.1, 1960. Price 3*s.* 6*d.*

Five hundred farmers attended the first Cambridge Irrigation Conference in November 1959, which served to crystallise the tremendous interest in this technique which had been stimulated by an abnormally dry year. A brief summary of the papers presented appeared on p. 143 of the April issue of WORLD CROPS.

The papers delivered were practical and down to earth, avoiding excessive technicalities, but aiming to assist an audience of men who, for the most part, had limited irrigation experience and needed elementary guidance. The tone of the many questions asked during the course of the conference confirm this need.

The report represents a valuable addition to the limited literature on the subject in Britain.

Cocoa Growing

Cocoa-Growing in Venezuela, Colombia and Ecuador by G. A. R. Wood. Pp. 57. Illus. Cadbury Bros. Ltd., Bournville, 1959. Price 5*s.*

This report is based on the author's visit to these countries, supplemented by references to other publications. He outlines the climate, method of cultivation, harvesting, yields, pests and diseases, preparation, marketing, research and future possibilities of cocoa growing in each country.

Among diseases occuring in the countries mentioned are three which appear to be spreading and for which there is no recommended control. Two of these diseases, ceratostomella wilt and cushion gall, have recently become of increasing importance. The third, monilia pod rot, is still spreading and could become serious in other important cocoa-growing countries. The author reviews briefly present knowledge of these diseases with illustrations for easy identification.

D. H. GRIST

Bulletins and Reports

Canada Department of Agriculture. Publication No. 12, July 1959, 'The Bulk Bin Method of Handling Fruit in British Colombia' by A. D. McMechan and W. F. Morton. Pp. 30, illus. Obtainable from the Research Station, Summerland, British Colombia. Price not stated.

Imperial College of Tropical Agriculture, the Regional Research Centre of the British Caribbean. 'Soil and Land-Use Surveys – No. 7, Jamaica, Parish of Clarendon', July 1959. Obtainable from the Imperial College, Trinidad, W.I. Price 20*s.*

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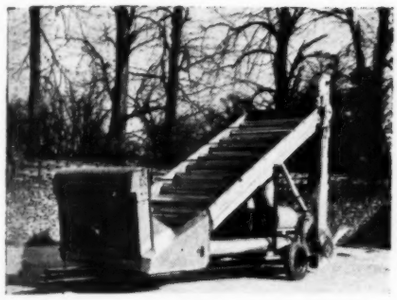
'Minor Elements and Their Effects on the Growth and Chemical Composition of Herbage Plants' by R. Dorrington Williams. Mimeographed Publication No. 1/1959. Obtainable from address above. Price 7*s.* 6*d.*

Machinery and Equipment

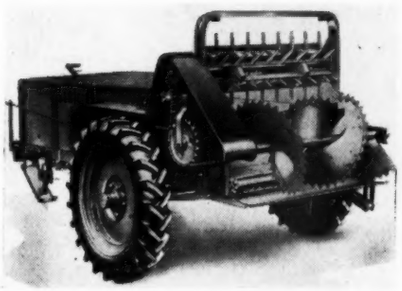
at

This Year's Royal Show



Alvan Blanch portable cascade drier, which may be driven by tractor power

Last year the premier agricultural show of Britain took place at Oxford; this year the 112th Royal Show was held at the 'other place' —Cambridge.



Bamford's new 'FS1' manure spreader shreds manure finely and spreads it evenly

THIS year witnessed the greatest display of modern agricultural machinery, implements and supplies ever seen. There were 590 stands at Cambridge this year, compared with 564 at Oxford, and no less than 40 applicants had to be turned down owing to lack of space.

An interesting and important innovation was the demonstration area of 6 acres to display certain aspects of modern agriculture in Britain. There was a working demonstration of the most up-to-date equipment for housing and feeding cattle, sheep, pigs and poultry on slatted floors of wood or concrete. There was a working display of various types of irrigation equipment of the latest methods of weed control in sugar-beet and of the treatment of hay.

An event of interest to show organisers in other countries was the Stockmen's Judging Competition. Stockmen employed by exhibitors of livestock were required to judge livestock, feeds and agricultural implements.

There were a host of other attractions, such as the musical drive of the King's Troop, Royal Horse Artillery, and the finals of the 1960 sheep-shearing competition, in which competitors had to be able to shear three sheep in 10 minutes, and the finals of the East Anglian tractor-driving contest.

A

The BTL-14D 'Tractoloader', which was exhibited for the first time by *Allis-Chalmers*, is a 4-wheeled, rubber-tyred multi-purpose machine for loading root crops, digging silage pits and for digging, lifting, carrying and dumping earth and other materials.

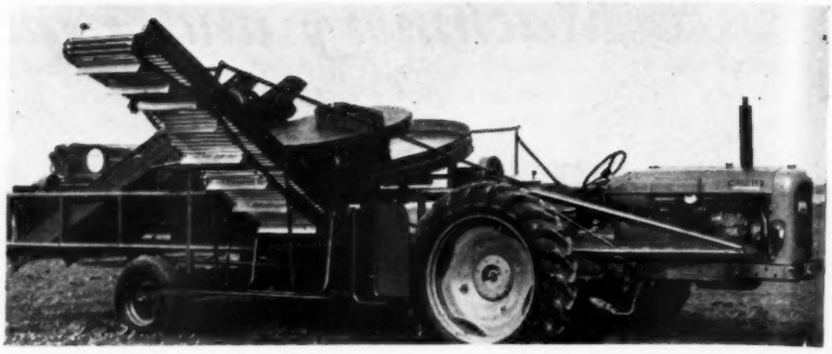
Jones Minor Mark IV automatic bale-tying pick-up with tractor p.t.-o. drive

It can also be used for multiple-furrow ploughing and other heavy draught work. It has an A.E.C. AV312 87-h.p. diesel engine with power-reversing, tractomatic transmission, which makes it possible to travel forward or to reverse without stopping the machine to declutch and change gears. Four forward speeds up to 22.3 m.p.h. and four reverse speeds up to 29.3 m.p.h. ensure correct operating speeds for every type of job and condition. Another special feature—an automatic cut-off which disengages the clutch when the brakes are applied—has the effect of placing the transmission in neutral and diverting full engine power to the hydraulic system to give more rapid operational work.

The *Alvan Blanch Development Co. Ltd.* have found it necessary to increase the range and variety of their driers to meet the needs of users in all parts of the world. The materials dried include small seeds, grass and lucerne, seed, all types of grain, including maize, coffee, wool, coir and various vegetable seeds. The outputs of their driers range from 10 cwt. to 10 tons of grain per hour. The machines can be driven by electric motors, by diesel engine and by tractor in the case of the portable driers. They had on view, examples of their cascade driers, a conveyor drier and a new drier with three or four trays in tiers.

B

In addition to a comprehensive range of engines and farm machinery,



A Catchpole potato harvester harnessed in cantilever fashion to a Nuffield power unit

Bamfords Ltd. introduced a new manure spreader specially designed for use on small farms and for manuring hilly ground where a larger machine is not able to operate satisfactorily. The new FS-1 is a tractor-drawn, road-wheel driven machine, which not only spreads the manure, but also shreds it finely, so giving more even distribution.

This company also showed their new BL-61 pick-up baler, the Bamford-Claeys M-103 combine, and the new W-2 'Wuffler' hay conditioner and aerator, a p.t.-o.-operated machine for speedy hay conditioning, prior to baling.

The *Barford* 'Atom 30' is a robust, multi - purpose, 2 - wheeled tractor, which is fitted with a *Villiers* 3-h.p. petrol engine. The improved plough and beam attachment makes it possible to plough furrows 8-10 in. wide by 8 in. deep in most soils with finger-tip control. This company also exhibited the Barford forage harvester with a swivel top, side-delivery chute and their 3-ton hydraulic end-tipping trailer with silage sides.

The comprehensive display of *David Brown* 'Albion' equipment included three items never previously exhibited at the Show. The '950 Implematic' tractor is a 42-b.h.p. diesel model and the '850' is a smaller tractor of 35 b.h.p. Both are equipped with the all-purpose hydraulics system which accommodates implements designed for automatic depth control, in addition to tools fitted with depth-control wheels; both have traction control, a patented hydraulic device enabling surplus implement weight to be transferred to the tractor rear wheels to eliminate wheel spin, and a differential lock, which provides solid drive to the rear axle when required as an additional aid to wheel grip. The third machine was the latest model 'Albion' manure spreader, which has detachable side extensions, a dynamically-balanced auger, 3-stage spreading mechanism and adjustable roller bearings on the land wheels.

Barford rear-mounted ditch cleaner clearing sedge and reed from a marsh dyke

C

Two new machines were included in the exhibits of the *Catchpole Engineering Co. Ltd.*—a hay conditioner and the down-the-row thinner which was the winner of the Norfolk Farm Machinery Challenge Cup this year. They also showed four types of sugar-beet harvesters. We were particularly interested in their self-emptying 'Cadet' carrier model. This model won the silver cup for the Best New Implement. With a root capacity of 30 cwt., which can be emptied in less than three minutes into a trailer; the 'Cadet' side elevator model delivers the beets into a trailer travelling alongside and spreads the tops ready for ploughing in.

Four new aids to farming efficiency were shown on the stand of *Colchester Tractors Ltd.* They were the 'Flemstofte' cultivator harrow, the 'Lemken' reversible plough, the 'Hammerbo' manure spreader and moving-floor trailer and the 'Lely' fertiliser broadcaster, which, it is claimed, will give a uniform spread.

D

In addition to their tractor-mounted and trailer machines, which we have already reviewed, the *Dorman Sprayer Co. Ltd.* were demonstrating their no-drift system of application, which represents an important advance in the development of crop-spraying machinery. The Dorman sugar-beet band sprayer was introduced for the first time and was mounted on a *Massey-Ferguson* '35' tractor for operation in conjunction with the *Stanhay* 5-row precision drill for the application of the *Murphy Chemicals* product, 'Endenthol Profan', while the seed is being planted.

Dorman 100-gal. 'Super' sprayer with a 31-ft. 6-in. boom fitted with non-drip nozzles

A big range of their agricultural tyres was to be seen on the stand of the *Dunlop Rubber Co. Ltd.* The principal exhibit was a selection of rear tractor tyres, including the 'Fieldmaster' open 'T' pattern, specially designed to give a high degree of adhesion, and 'Tractor Universal RT35' for use both on the farm and on the open road. Among the front-wheel tyres was the TF9, designed to give positive steering without side-slip. The extra strong side walls of this tyre give protection against impact and snags. Special tyres included a tractor-trailer tyre and a selection of tyres for barrows, trolleys and milk prams.

G

The Goodyear Tyre and Rubber Co. are manufacturers of many types of agricultural tyres which were shown on their stand. These included the 'Traction Sure-Grip', the 'Super Rib' tractor front tyre, a row-crop tyre with wide base construction and their 'All-Weather' rear tractor tyres with a bevelled edge pattern. The importance of using the right type of transmission belting was stressed and there were endless cord and 'V' belts for a fractional h.p. up to the requirements of the largest farm power unit. Their range of hoses has been extended to include some to carry butane, propane and other petroleum gases.

H

The special feature on the stand of *Hayters Ltd.* was the new 2-ft. 3-in. 'Springmatic' orchard wing for fitting to the Hayter '6/14' tractor-drawn and powered rotary grass cutter. These wings can be moved radially so that it is possible to cut the grass right up to and around tree trunks, without damaging them. This is accomplished by means of a compensating spring mechanism having infinite adjustment to govern the radial movement and later force the return of the wing to its normal position. The company's latest rotary scythes have hinged cutter blades, which give if a hidden obstruction is encountered in long grass (see WORLD CROPS, 1959, **11**, 446).

I

A low-cost bale-drying and ventilating unit for the small farm, the 'Clydebuilt' haulm pulveriser for the small potato farmer, and the 'Clydebuilt' mower rake, designed to ensure smoother baling, were the three principal exhibits of the *Innes Walker (Engineering) Co. Ltd.* The last is an ingenious machine for preventing the bunching and knotting of hay, which will accelerate drying and avoid blockages in the baler.

J

A new tractor-mounted machine of Australian design, which will introduce fresh seed as well as fertilisers into existing pastures, marginal land and newly cleared land, without the usual tilling operations or interrupting grazing, was introduced by the *Jeffery Engineering Co. Ltd.*, together with an electrically - controlled grain flow regulator for bagging off a predetermined weight of grain, and the Kidd 'Rotaflail' high-speed forage harvester for silage and hay making.

Not only are *Jones Balers Ltd.* engaged in the manufacture of the 'Minor' and 'Major' baling machines, but they also produce a tanker and a bagger model, diesel-driven combine harvester, a manure spreader and a large and a small model hay tedder, all of which were exhibited on their stand.

L

The stand of *Landmaster Ltd.* showed how a machine which mechanises all the heavy and slow cultivating jobs on the farm or smallholding can be used to make the most of the available manpower and get the maximum amount of work out of one basic

'Lodematic' sack humper in action

machine. The Landmaster '150' has grown out of sound practical farming experience and years of specialisation in the manufacture of medium-to-small types of cultivating machinery.

M

The exhibits on the stand of *Martin-Markham Ltd.* showed the remarkable versatility of this company. They ranged from the 'Express' forage harvester and 'Universal' silage trailer to the 'Rainmaker' 50-acre irrigation unit. The 'Powertiller' rotary cultivator, the 'Superdrive' fertiliser broadcaster and tractor implements, such as disk ploughs, spring-tine cultivators, harrows and hoes, were included.

A complete range of equipment covering the handling of potatoes from seed-time to harvest was the leading feature of the *Massey-Ferguson* display. These included their automatic potato planter, which has a fertiliser attachment, and also a 2-man planter for the small grower. Other items in this display were a palette tippler and the revolutionary harvester which was first introduced last year and has since proved itself. In addition, the company showed 18 of their '35' and '65' tractors and a wide range of implements, including large and small balers, two types of seed drill, small and large forage harvesters and ploughs, mowers, harrows, hoes and other tillage implements.

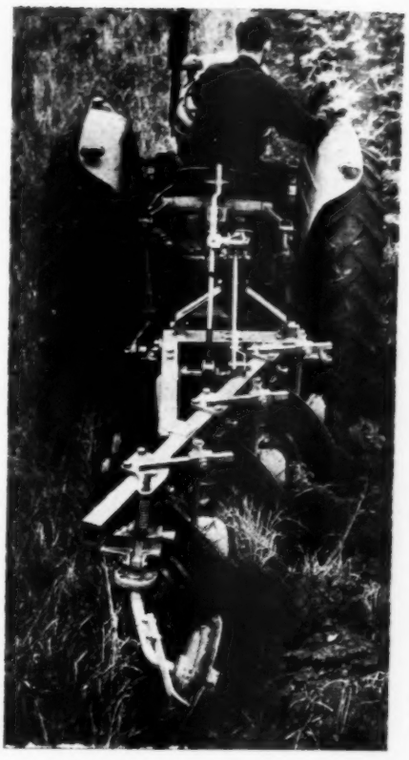
The *Metal Box Co.'s* stand summarised the service which this organisation offers to agriculture and horticulture. The return-flow bagging machine, seen in action, is designed to pack potatoes, carrots, onions and Brussels sprouts in 'Diothene' polythene bags and to deliver five to six 5-lb. bags per station per minute. 'Poly-Punnets', made of moulded polystyrene, were offered for packing soft fruits and apples.

O

The *Owen Organisation* were exhibiting the products of *Rubery Owen & Co. Ltd.*, *S.K.H. & Son* and *Salopian Engineers Ltd.*, including trailer axles and wheels, fuel tanks, axle casings and other pressed components; the S.K.H. rotary fertiliser distributor and the 'Delta' spring-tine cultivator and a heavy-duty cultivator for breaking up crusts, together with the Salopian hydraulic trailer and a big selection of their range of mechanical implements.

P

A new 6-cylinder diesel engine, the *Perkins* 'Six (TA)', which is designed for the larger types of self-propelled combine harvesters and for medium-, heavy-wheeled and crawler tractors, will develop 76 b.h.p. at 2,000 r.p.m., and the 1.6-litre *Perkins* 'Four 99', a small power unit for combines, which will develop 35 b.h.p. at 3,000 r.p.m., were introduced for the first time.



Martin-Markham 3-furrow disk plough seen in action

R

'Ransomes Mow the World' is the proud boast of *Ransomes, Sims & Jefferies Ltd.*, who showed an extensive

A return-flow bagging machine for packing potatoes, carrots, Brussels sprouts and onions by Metal Box Co. Ltd.

selection of five types of hand mowers, six motor mowers, two gang mowers and seven other powered mowers for fine cutting and rough cutting and for special uses. New to this extensive range is the TCR3006 'Tillorator', a mounted spring-tine harrow for cultivating strips 9 ft. 10 in. wide. The vibratory action of the 27 tines breaks up the clods and reduces the ground to a fine tilth. Other tractor implements shown were a rugged rotary slasher and a rear-mounted mower with a 5-ft. cutter bar.

Ransome's rotary slasher clearing gorse land

Root Harvesters Ltd. are specialists in sugar-beet, potato and carrot machinery. The Whitsed model 'RB' harvester they showed is designed for bulk loading and bagging of potatoes with the minimum of damage, for after leaving the digger elevator the roots fall only on rubber-covered parts and there is just a short drop from the discharge conveyor into the trailer. Their down-the-row thinner for sugar-beet is a 5-row power-driven machine and the 'Todd' beet cleaner is a device for cleaning the beets while they are being transferred from the tractor scoop into the lorry.

On the agricultural side of their business *Rotary Hoes Ltd.* have made a notable step forward in drainage machinery with the introduction of their new 4-wheel-drive 'Super' trench digger. This machine is based on the 4-wheel drive of the *Fordson* 'Major', which incorporates the 'Manuel' patent. Another outstanding development shown in prototype form was the 'E'-mounted Howard 'Rotavator' fitted with a conversion for potato haulm pulverisation. This conversion kit enables a standard 'Rotavator' to be used as a potato haulm pulveriser when required.

S

A fully 'automated' feed-preparing plant for milling, mixing and pelleting balanced rations for cattle, pigs, sheep and poultry was demonstrated by *Scottish Mechanical Light Industries Ltd.* In this system any ScotMec fan-type hammer mill—from ¾-60 h.p.—can be used, as well as any ScotMec mixer—from 5-30 cwt. capacity. The ground meal is blown into the mixer, which will run for a preset mixing time, then its contents are transferred automatically to the pelleter feed bin and the pelleting machine starts to operate. As soon as the meal in the feed bin is at a low level the auger which conveys the mixed meal restarts and it will stop automatically when the bin is full. When the mixer is empty a warning is given that milling and mixing can recommence and when all meal in the system is finished there is a second warning. The overall control panel has a system of lights to show which machines are in operation and there are 3-way switches to enable each to be run automatically, non-automatically or to be stopped.

Simms Motor Units Ltd. had a display of a wide range of fuel injection equipment for diesel engines and a selection of electrical and other products for use on farm vehicles, agricultural tractors and stationary farm engines, including starter motors, dynamos, control panels, ignition equipment, lamps and other accessories. The Simms 'Inertia Starter' makes it possible for diesel engines to be started by hand with a minimum of effort in about 10 seconds.

SKH rotary fertiliser distributor gives even and rapid distribution

The Peter Standen 'Vibro-Rota' tiller, introduced by *F. A. Standen & Sons Ltd.*, is a dual-purpose machine for soil cultivation and seedbed preparation. Vibrating tines placed in front of a rotary cultivator work to a depth of 5 in. or 6 in. below the rotating blades; the land is not only prepared and levelled, but roots and

Horndraulic 'Pixtone' stone picker seen in action

underground rhizomes are brought to the surface. A tanker model of their sugar-beet harvester was also shown for the first time, together with other selections from their range of mechanical farm implements.

Improved hay making is the order of the day. *Stanhay (Ashford) Ltd.* were showing the new 'Windrum' haymaker, a machine which facilitates hay making. A large enclosed drum, revolving at high speed against the direction of travel, lifts and aerates the crop by the wind created by the drum, which floats and follows the contours of the land. Another exhibit was the Stanhay seed-spacing drill, which is now fitted with a stone-clearing attachment. The 'Super Ditchmaster' is an hydraulically - operated bucket grab which, it is claimed, will clean and deepen ditches up to 11 ft. deep or 10 ft. wide and can be slewed through 275°.

Steel Fabricators (Cardiff) Ltd. were again showing the 'Pixtone' stone picker, which they introduced last year. This is a 2-wheeled trailed machine which will gather stone from 1½-9 in. in dia. It will clear a 40-in. swath and gather about 2,500 lb. of stones. No p.t.-o. or hydraulic equipment is required, as it is operated by a separate air-cooled petrol engine. They were also exhibiting new types of loaders and the Meyer hay conditioner.

T

The name *Taskers of Andover* is associated with buckrakes and muckrakes, earth scoops and grader blades, metal- and timber-bodied trailers, and now they have introduced a new rotary slasher, a manure spreader and a fertiliser distributor.

There was a very attractive display of power chain saws on the stand of *Teles Smith Ltd.* The 'Little Tiger' has been further improved by providing it with a more powerful engine of lighter weight and fitting a new 'Amal' float carburettor, which will work in all positions; it is now being produced in three sizes—18-in., 22-in. and 28-in. capacity. They also had the 2-man Teles saw, which is powered by Villiers petrol engines of special design.

Those who are concerned with the speedy and efficient handling of sacks and bags would have been attracted to the stand of the *Thames Packaging Equipment Co.* to see the 'Fischbein' bag stitcher for closing sacks and paper bags; the 'Kleen-Kut' portable bag opener for opening multi-wall paper sacks and polythene bags and cellulose film bags and jute sacks; and the 'Stickla', a high-speed bag sealer which hermetically seals polythene and cellulose film bags and multi-wall paper sacks of any width and height.

V

The *Villiers Engineering Co. Ltd.* have made a tremendous contribution to modern power farming by producing engines to meet all needs. The full range of Villiers and JAP 2-stroke and 4-stroke engines with power ratings from ⅛-14 h.p. were displayed on their stand and examples of their many applications in agricultural and horticultural machinery could be seen on the stands of other manufacturers.

W

Whitlock Bros. Ltd. are specialists in two fields—earth excavating and moving and the cleaning and handling

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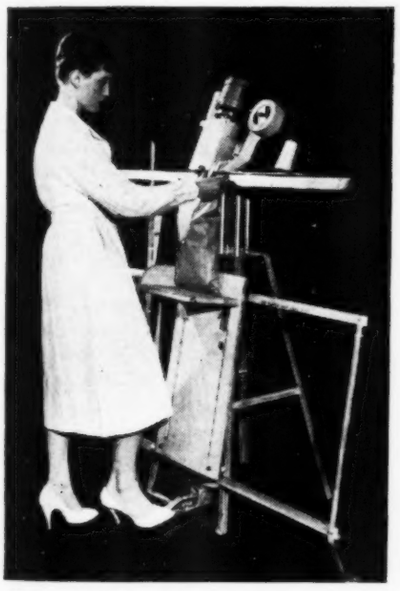
England

Stanhay 'Super Ditchmaster' clearing a wide overgrown ditch

of grain. They showed the Petkus Linde F8 seed cleaner, conveyors and elevators for grain in both timber and steel, and feed mixers of 7- and 10-cwt. capacity. In the other field they showed the 'Dinkum Digger Major' hydraulic excavator and power shovel, a 5-ton steel dump trailer and 8- and 15-cwt. transport boxes. The Whitlock general-purpose trailer can now be fitted with silage extensions and these are available in various sizes to fit other makes of trailers.

The 'Sila-Masta' was offered by *John Wilder Ltd.* in two versions, according to the working width required: 40 in. or 52 in. The former is designed to work with a small tractor of 27 h.p. and upwards and the '52' requires 35 h.p. or more; both machines are strong enough to work with the bigger tractors if conditions so demand. If the machine is required to make considerable tonnages of silage each season at high speeds the 'SMD-52' is the recommended choice.



The 'Stickla', a high-speed bag sealer by the Thames Packaging Equipment Co.

Wright Rain 'Vector' sprinkler spreading liquid manure

A flashing light which can be hooked on to a Wolseley electric fence at any point, which can be varied from day to day and which will give a bright flash at every pulse of current, will provide two methods for repelling wild life. This useful device was shown on the stand of *Wolseley Engineering Ltd.* for the first time, together with a heavy-duty version of the well-known 'Merry Tiller', which is fitted with a heavier and more powerful engine and various new attachments and accessories.

A feature of the display by *Wright Rain Ltd.* was a slatted floor housing for cattle linked with their manure rain system for the useful disposal of dung and urine. The company also gave daily demonstrations of the new 'Prefect' sprinkler and using the new 'Long-life' tubing, which has a reinforced end which prevents damage during movement. Other sprinklers shown included the 'Monitor' for small market gardens and orchards, the 'Senior', the 'Master' and the 'Major' for the heaviest applications.

'Sila-Masta 40' at work behind a 25-h.p. tractor, with a following trailer

Problems of Agriculture

The special feature of the August issue of *The Manufacturing Chemist*, another journal of the *Leonard Hill Technical Group*, is 'Filtration'. This is an important operation in the processing of certain agricultural products, such as fruit juices, vegetable oils, wines, spirits and beer, and in the manufacture of the various chemicals used in modern agriculture.

All the articles in the current issue of *Dairy Engineering* will be of interest to farmers. Of particular importance to countries trying to improve the quality of their milk are two which deal with lighting and with cleaning routines in the dairy.

Food Manufacture is continuing its important series of articles on the vital subject of World Food Supplies, and *Chemical and Process Engineering* has two articles on dust control which will interest those engaged in the production of agricultural chemicals and the processing of agricultural products, such as flour, where dust is a serious problem.

Coming Events

Organisers of meetings, conferences and agricultural exhibitions are invited to supply information for this regular feature. This should be received by the Editor at least three months prior to the event.

Plant Protection.—An international meeting on Organisation and Methods of Plant Protection is to be held at Wageningen from 1-26 August, 1960. Further particulars may be obtained from the Director, International Agricultural Centre, 1, Generaal Foulkesweg, Wageningen, Netherlands.

Agricultural Co-operation. — The British Council, in association with the Plunkett Foundation and the Federation of Agricultural Co-operatives of Great Britain and Ireland, is organising a course in agricultural co-operation at Cropthorne, Worcestershire, from 14-27 August. Applications should be made to the Director, British Council, 65 Davies Street, London, W.1.

Soil Science.—The 7th International Congress of Soil Science will be held from 14-24 August, 1960, at Madison, Wis. Particulars may be obtained from Dr. M. B. Russell, Department of Agronomy, University of Illinois, Urbana, Ill., U.S.A.

Agricultural Marketing.—A 2-day course on 'The European Common Market — Progress and Problems' is to be held in London on 27 and 28 August. Further particulars from the Federal Trust for Education and Research, 10 Wyndham Place, London, W.1.

Entomology. — The 11th International Congress of Entomology will be held in Vienna from 17-25 August, 1960. Information from Dr. Max Beier, Congress Secretary-General, c/o Naturhistorisches Museum, Burgring 7, Vienna 1, Austria.

Forestry.—The 5th World Forestry Congress takes place from 29 August-10 September, 1960, in Seattle. Details may be obtained from Dr. I. T. Haig, Executive Secretary, 5th World Forestry Congress, c/o Office of International Conferences, Department of State, Washington 25, D.C., U.S.A.

Food. — The British Association for the Advancement of Science will hold its annual meeting in Cardiff, Glamorganshire, from 31 August-7 September. Of particular interest is the Symposium on World Food and Population, which will be held on Monday, 5 September. The principal speakers will include Dr. N. C. Wright, Deputy Director-General of FAO; Prof. D. V. Glass, Professor of Sociology in the University of London; Prof. W. A. Lewis, Principal, University College of the West Indies; Dr. L. Dudley Stamp, Director, Land Utilisation Survey of Great Britain; Sir Alexander Fleck, Past President of the Association; Dr. H. D. Kay, Professor Emeritus, University of Reading; Prof. P. M. S. Blackett, Professor of Physics, Imperial College of Science and Technology. Copies of the preliminary programme may be obtained free of charge from the Secretary, British Association, 18 Adam Street, Adelphi, London, W.C.2.

Rubber Research.—An International Conference on Natural Rubber Research, sponsored by the Rubber Research Institute of Malaya, with the support of the Government of the Federation of Malaya and the Rubber Producers' Council, will take place in Kuala Lumpur from 26 September–1 October, 1960. Further information may be obtained from the Rubber Research Institute of Malaya, P.O. Box 150, Kuala Lumpur.

Oils and Oilseeds.—A conference covering the production, processing, chemistry and utilisation of vegetable oils and fats is to be held from 13-16 October at Bari, Italy. Further information can be obtained from Dott. Eng. Borelli, Secretary of the Organising Committee, Borsa Merci di Bari, Corso Cavour 2, Bari, Italy.

Weed Control.—The 5th British Weed Control Conference will be held in Brighton from 7-10 November. Information and registration forms from the Secretary, British Weed Control Conference, 52 Bedford Row, London, W.C.1.

Corrosion and Metal Finishing.—The 1960 Exhibition will take place at Olympia, London, from Tuesday, 29 November, to Friday, 2 December.

Bookings are now being accepted and full information is available from the Organiser, *Corrosion Technology*, Leonard Hill House, Eden Street, London, N.W.1.

Agricultural Exhibitions

Germany.—An Agricultural Exhibition is to be held at Saarbrucken from 23 April-21 October. Further information from Ausstellungstechnische Leitung und Organisation Stadtverwaltung, Saarbrucken.

The National Agricultural Show takes place in Stuttgart from 24 September-2 October. Information from Stuttgarter Ausstellungs G.m.b.H., Am Kochenhof 16, Stuttgart-N.

Australia.—An Agricultural and Industrial Exhibition will be held in Brisbane from 11-20 August. It is organised by the Royal National Agricultural and Industrial Association. Details may be obtained from G.P.O. Box 122B, Brisbane, Queensland.

The Royal Agricultural Show is to be held in Perth from 30 September-6 October. Particulars from the Royal Agricultural Society, 239 Adelaide Terrace, Perth.

U.S.A.—The 8th annual Farm Progress Show will be held near Joliet in Will County, Illinois, from 21-23 September. Further information from the Organiser, Farm Progress Show, Prairie Farmer Publishing Co., 1230 Washington Boulevard, Chicago, Illinois.

Agricultural Chemicals

Deficiency of Magnesium

Magnesium is an element which enters into the chlorophyll molecule – the green colouring matter of leaves – and where it is lacking the leaves are yellowish and necrosed. It is easier to prevent a deficiency of magnesium than to cure it and in soils where a deficiency might develop this element needs to be supplied to replace losses through plant uptake or, where the rainfall is heavy and torrential, through leaching.

The uptake of magnesium by various common crops has been estimated in terms of magnesium oxide per acre to be: cereals, 10–20 lb.; hay, 20–30 lb.; potatoes, 20–30 lb.; and sugar-beet, 50–60 lb. Apart from this normal uptake, magnesium salts, being readily soluble in rainwater, can be lost from the upper horizons of the soil, and light sandy soils are particularly liable to develop a magnesium deficiency.

Where such a deficiency is known to exist heavy applications of magnesium fertilisers are necessary. Where a deficiency might develop 'Magnesium Nitra-Shell' is an assurance against the occurrence of magnesium deficiency. *Shell Chemical Co. Ltd.*, who are the manufacturers of this new product, state that it contains 20.5% N and 7% of magnesium oxide. This product, which has been formulated from dolomitic limestone, $CaMgCO_3$, thus offers an economical insurance, as the carbonate is only slowly dissolved. It should be used regularly on crops which need a nitrogen top-dressing as well.

Cleaner Farming

The discovery of dalapon by Mr. Keith Barron, of the *Dow Chemical Co.*, in 1954 represented a major contribution towards weed-free farming. 'Dowpon' is a formulation containing dalapon in the form of the sodium salt of 2,2 dichloropropionic acid, which is offered by *Dow Agrochemicals Ltd.* for the control of couch, creeping bent, black bent, onion couch, reeds, reed mace and many annual grasses which are weeds, such as wild oats, meadow grass and black grass.

The company has produced a remarkably well-illustrated and instructive manual giving the characteristics of the product and its application in the control of weeds in arable crops, such as sugar-beet, potatoes, lucerne and linseed, and in such horticultural crops as soft fruits, rhubarb, asparagus and bulbs, and also in apple orchards. The product may also be used for the control of aquatic weeds in drainage channels and for bracken control.

This brochure, which contains some remarkably fine illustrations in colour of the above-mentioned weeds and some useful operational information in the appendixes, may be obtained through our Reader Service.

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For Barley on Chalk

Trials with nitrogen dressings on spring barley, carried out for several years on chalky soils in Hertfordshire, England, have demonstrated the superiority of nitrate of soda over sulphate of ammonia on these soils, according to a report received from the *Nitrate Corporation of Chile Ltd.*

In these long-term experiments three levels of ploughed-in straw were combined with three levels of nitrogen. In the wet summer of 1958 and the dry one of 1959, 12 plots were split at random and used to make a comparison of the two forms of nitrogen. In both seasons, according to the statement, there was a very striking visual difference in favour of nitrate of soda, which persisted throughout the growing season, and, taking the two seasons together, the overall superiority was very nearly 5 cwt. of grain per acre.

At the present time nitrogen is twice as expensive in the form of nitrate of soda compared with sulphate of ammonia, but the value of the additional yield of barley obtained with the former was equal to twice the difference in the cost of the applied nitrogen in 1958, and nearly six times as much in 1959.

Mr. Ben Branch, President of Dow International, (centre) is seen here with Dr. Walter Ripper, of Dow Agrochemicals, and Mr. Leonard Hill (on his right) and with Dr. R. de B. Ashworth, of the Ministry of Agriculture, Fisheries and Food, and Mrs. Joan Jones, of Isis Appointments Register (on his left)

Phosphates are Food

A by-product in the manufacture of gelatine is di-calcium phosphate. The extraction of the phosphates from the bone occurs during the acidulation process in the first stage of gelatine manufacture and the di-calcium compound is subsequently precipitated from the phosphate liquor by adding lime at a very carefully regulated rate. The quality of the resulting product is then rigidly tested to ensure freedom from harmful ingredients.

It is being increasingly used in Europe in cattle feeds and its high nutritional value is universally recognised. Di-calcium bone phosphate is also produced for use as a fertiliser and is gaining favour with farmers in many countries. The product is being sold under the brand name 'Trefosphate' and is marketed by *Chemicals and Feeds Ltd.*, one of the *Leiner Group of Companies.*

New Sorghum Hybrids

Four new hybrid varieties of sorghum are announced in the winter 1959 issue of *Your Crops*, which is published by the *Asgrow Seed Co.*, of U.S.A. They are 'Coastal', a smut-resistant, heavy yielder, suited to sorghum-growing areas, except those where the season is short or under extreme dry-land conditions; 'Ranger', a heavy-yielding adaptable variety, which will give good yields under dry-land conditions and under irrigation can be expected to give even heavier crops; 'Red Raider', a distinctly short hybrid from 36-40 in. in height, which is important for areas where lodging may occur owing to high winds; finally, there is 'Rocket', which blooms early and dries rapidly, so permitting an early harvest. This is important, either under dry-land conditions, where earliness is important, or where delayed planting or replanting may be necessary.

Weeds in Cereals

'Tri-Farmon 41' is a hormone-type of weedkiller produced by *Farm Protection Ltd.* for the control of weeds in cereals, which incorporates 2,3,6-trichlorobenzoic acid, a product supplied by *Du Pont.*

East Goes West

On a 10-day tour of Britain as guests of *Fisons Fertilisers Ltd.*, a delegation of Soviet scientists visited Levington Research Station in Suffolk. In the Soil Chemistry Laboratory they took a keen interest in what Dr. J. G. Hunter, Deputy Research Director (back to camera), had to say about the work of the station. In the group are (left to right), back row: Mr. P. I. Gorbic, head of a superphosphate factory at Sumy; Mr. A. P. Kevorkov, of the All Union Scientific Research Institute of Fertilisers and Agricultural Soil Chemistry; Dr. J. R. Arthur, head of the Chemistry Department; Dr. J. A. Storrow, Director of the Research Station; and Mr. E. A. Sawyer, Export Manager of Fisons Fertilisers Ltd.; Miss S. S. Kostikova, interpreter; Miss L. F. Nikitina, Chief of Laboratory, Chemical Combine of Nitrogenous Fertilisers at Stalinogorsk; and Mr. N. N. Postnikov, head of the delegation, and a chemical engineer with the Scientific Institute of Fertilisers and Insecto-Fungicide.

Seed Dressing for Peas

'Orthocide' is the registered trade mark of a new seed dressing for peas, which is claimed by the manufacturers to be effective against pre-emergence damping off, foot rots and seed decay and will, in consequence, give healthier and faster-growing seedlings and higher yields as a result of increased seedling emergence. The *Murphy Chemical Co. Ltd.* also recommend it for field beans, broad beans, maize, brassicas, marrows, cucumbers, spinach and grass seed.

The seed can be dressed in the usual type of seed-dressing machine or in a simple cylindrical container, such as a drum or a large jar, by rolling it for a few minutes. No 'sticker' is required, as the dressing is sufficiently adhesive.

It is based on captan, which is virtually non-irritant and non-poisonous to humans and animals, though inhalation of the dust must be avoided and it should not be allowed to contaminate food or feeding stuffs.

Rust Mites on Citrus

Mites on non-bearing citrus trees can infest producing trees, so they, too, need to be sprayed to keep down crop losses. The mites rupture the cells of the leaves, suck the sap and cause severe damage.

'Kepone' is a chlorinated ketone supplied by *Allied Chemical International* for the control of mites on non-bearing trees. It has a long-term action, which reduces the need for subsequent spraying, so saving money and unnecessary labour.

World Crop Reports

High Wheat Production Forecast

INTERNATIONAL REPORT

Wheat

Another good winter wheat crop is expected in most countries this year. Winter wheat amounts to about 90% of all the wheat produced outside North America.

Prospects are for a bumper *U.S.* crop of 977 million bushels; this would be the fifth largest out-turn on record. Prospects are generally good in Western Europe, where in most parts the crop came through the winter in good shape. Incomplete information on Eastern Europe, however, indicates that conditions there are less favourable than at this time last year.

In the six countries which in 1959 produced about 90% of Western Europe's wheat, the conditions are as follows:

Winter wheat is in good condition in *France* and if the weather continues to be favourable another large crop may be harvested this year, despite some reduction in acreage. Moisture supplies are good in *Italy* and the crop is promising; acreage, however, is reported smaller than in 1959. In *West Germany* winter grains developed well and the outlook has been good, though there is now reported to be some concern over lack of moisture.

Official *U.K.* reports stated that the condition of the crop was generally good, though cold weather had slowed growth in most areas. In *Spain* earlier hopes of a bumper crop are not materialising because of excessive moisture in many parts of the country. Torrential rains in early March, following rainstorms in December, caused some damage. Wheat acreage in *Greece* is about 5% less than last year because the Government has encouraged changes to other crops. However, prospects for the growing crop were reported to be very favourable.

In Eastern Europe conditions are reported to be less favourable than last year, especially in *Poland* and *Czechoslovakia*. Poland's crop has suffered from extensive winter kill, continued drought and shortage of fertiliser. In Czechoslovakia reports indicate that difficulty in seeding the crop reduced acreage, and the crop has not come through the winter in good condition. Prospects are generally good in *Yugoslavia*, but are not as good as last year, when a record crop was harvested.

Wheat growing in an Italian field

The outlook is also less favourable than last year in *India*, as heavy rains and hailstorms caused damage in some areas. While the extent of the damage is not yet known, the wheat out-turn is expected to be below the bumper crop of 1959 despite some increase in acreage.

Crops are generally making good progress in *North Africa*.

REGIONAL REPORTS

Rhodesia and Nyasaland

Production of *groundnuts*, for many years one of the most valuable agricultural crops of Southern Rhodesia next to maize and tobacco, is declining. Rosette disease and indifference, caused by low prices, have reduced marketed output from the peak level of 304,000 bags in 1956 to 46,000 bags in 1959.

The bulk of the territory's groundnut crop is produced by Africans, whose marketed output, according to figures released by the Economics and Markets Branch of the Federal Ministry of Agriculture, increased rapidly from 45,000 bags 10 years ago to 290,000 bags in 1956 and 213,000 bags the following year. Two years ago production fell to 91,000 bags and last year it dropped again to 45,000 bags.

European output of groundnuts in Southern Rhodesia showed a similar trend in the past 10 years, rising to 15,000 bags in 1954 and dropping rapidly in the past two seasons to only 1,000 bags last year. Production by European farmers has been limited by the fact that the labour requirements for groundnut growing are high and by the relatively greater profitability of other crops, such as maize. Low prices and disease in recent seasons have helped to produce a feeling of indifference among them to the production of groundnuts.

The main reason for this decline appears to have been the widespread incidence of rosette, which during the past two seasons has played havoc with the crop. To overcome the problem of rosette disease, the Territorial Government has been distributing treated seed to African growers and is advising them on the best cultural methods. The Government has also decreased the Native Development Fund levy so as to raise the producer price and encourage Africans to market a greater proportion of the crop.

In our report on *cotton* production for this season (1959-60) on p. 160 of the April issue it was stated that, except for experimental irrigated plantings at the Gatooma Research Station in Southern Rhodesia, all cotton in the Federation is rain grown. This is not correct, as the bulk of the Southern Rhodesian crop is grown under irrigation in the Sabi Valley, an area with a rainfall below 20 in.

Argentina

The 1959-60 *cotton* crop now being harvested is estimated at 450,000 bales (500 lb. gross). This is the smallest crop since 1948-49 and marks the second straight year of declining production.

The crop as estimated is down 2% from the 460,000 bales produced in 1958-59 and is 20% below average production of 562,000 bales per year in the past five seasons. The decline this season is attributed mainly to adverse weather and slightly smaller acreage—1,200,000 acres, compared with 1,225,000 in 1958-59.

The official estimate of area sown to *sunflower seed* in 1959-60 is 3,188,000 acres, 4.5% less than in the previous year. Production of sunflower seed in 1958-59 was 426,600 short tons from 1,893,330 harvested acres. The average sown area for 1955-59 was 3,036,000 acres and the 1950-59 average was 3,028,000 acres. The outturn of sunflower seed in 1955-59 averaged 619,000 short tons and the 1950-59 average was 662,000 tons.

Mexico

Mexico's 1959–60 *cotton* crop, currently estimated at 1,710,000 bales (500 lb. gross), is down 27% from last year's record crop of 2,345,000 bales and is 15% below average annual production of 2,050,000 bales during the past five years (1954–58).

Acreage and production declined in all major cotton-producing districts this season, with sharpest declines in Matamoros, Delicias and West Coast areas. Total plantings, estimated at 1,795,000 acres, were down 28% from 2,510,000 acres in 1958–59. The principal cause of the acreage reduction was tighter production credit, the result of declines in Mexican cotton prices, which began late in 1958, and prospects of lower prices for the 1959 crop.

Tobacco acreages planted in Mexico in late 1959 (for 1960 harvest) are expected to be larger than last year's plantings. With average growing conditions the crop should be about one-third larger than the 1959 harvest, which was much smaller than normal.

Total production of all kinds of leaf in 1959 was 65.5 million lb., compared with 81.3 million in 1958. Heavy rains and flooding, particularly in the important light tobacco-producing state of Nayarit, cut down the harvest of light leaf. In Veracruz both early-season drought and later excessive rains held yields of dark leaf below normal.

Mexico's 1959 *maize* crop is a record of 216.5 million bushels, according to preliminary estimates. This is 7% above the previous record a year ago and is 53% above the 1950–54 average.

Weather in the major producing areas has been very favourable, but there were some minor losses caused by floods and hurricanes in Tobasco and Colima. The record crop is attributed to increased acreage and higher yields. Greater use of fertiliser and of improved seed contributed to the increased yields.

Increased acreage, mainly in Tamaulipas, appears to be a result of diversification of agricultural production in some districts that formerly concentrated on cotton. Maize and sorghums now seem to have become permanent secondary crops.

Brazil

Brazil's 1960 *castor bean* production is expected to be substantially larger than the small out-turn of 1959 and may nearly equal the large crop of 1957 if weather is reasonably favourable. Forecasts currently range between 200,000 and 240,000 short tons.

Plantings are reported to be larger than last year. Higher market prices and industry interest are stimulating the increase and are also expected to encourage the harvesting of wild castor beans. However, if bad weather should strike major producing areas, as it did in the last two years, production will be somewhat less than forecast.

The 1959 castor bean crop is now believed to have totalled not more than 165,000 tons, 13% less than in 1958 and the smallest since 1942. The reduction, almost entirely in Bahia, the major producing state, was due mainly to unusually dry weather during the growing season, but relatively low prices were also an important factor.

French West Africa

The estimate for 1959-60 commercial *groundnut* production in the seven semi-independent republics of the former Federation of French West Africa has been revised upward to 934,000 short tons (unshelled basis)—an increase of 71,000 tons from earlier estimates. The tonnage is still substantially less, however, than 1958-59 production of 1,015,218 tons.

Senegal's 1959-60 crop is now expected to reach 771,000 tons. The 1958-59 crop was 783,000 tons. Lack of rain last summer—the basis for most of the estimated decline in this year's crop—apparently did not reduce yields as much as was expected.

England and Wales

On 1 June autumn-sown *wheat*, *barley* and *oats*, on the whole, were very satisfactory and most crops were recovering from early yellowing; eelworm and mildew were occasionally reported. Spring-sown wheat, barley and oats generally made good progress, although some later sown crops were uneven. Mildew, eelworm and frit fly were reported from a few areas. *Mixed corn* looked well. The small acreage of *rye* was very satisfactory. *Winter beans* were mainly vigorous and healthy; some blackfly was reported. Spring beans were a promising crop. *Peas for stockfeeding* were a good crop, but some bird damage was reported.

Early *potatoes*, although backward in some areas, had mainly recovered from early frost damage and made rapid growth. Lifting had commenced in a few districts. Second early and main-crop varieties on the whole were satisfactory, although some crops were uneven.

Early sowings of *sugar-beet* were satisfactory on the whole, but some later sowings were patchy due mainly to dry conditions. Growth generally was satisfactory and singling was in progress. The drilling of *mangolds* was virtually complete; germination had been fairly satisfactory. In some areas singling had commenced, but on the whole growth was slow. Early-sown crops of *kale* looked well, but later sowings were germinating unevenly: a considerable proportion of the crop remained to be sown. A few severe localised flea beetle attacks were reported.

Good progress was also made with the sowing of *turnips*, *swedes* and *fodder beet*, but on the whole germination and growth were slow.

Acknowledgment is made to *For. Crops. Mark.* for much of the information contained in the above reports.